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For related information see also *Astronautics*.

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82 DOCUMENTATION AND INFORMATION SCIENCE 2261
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software*.

83 ECONOMICS AND COST ANALYSIS N.A.
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE 2262
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 2262
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences*.

88 SPACE SCIENCES (GENERAL) 2263

89 ASTRONOMY 2264
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 2264
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 2276
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

92 SOLAR PHYSICS 2277
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 2278
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

GENERAL

99 GENERAL 2278

Note: N.A. means that no abstracts were assigned to this category for this issue.

SUBJECT INDEX I-1
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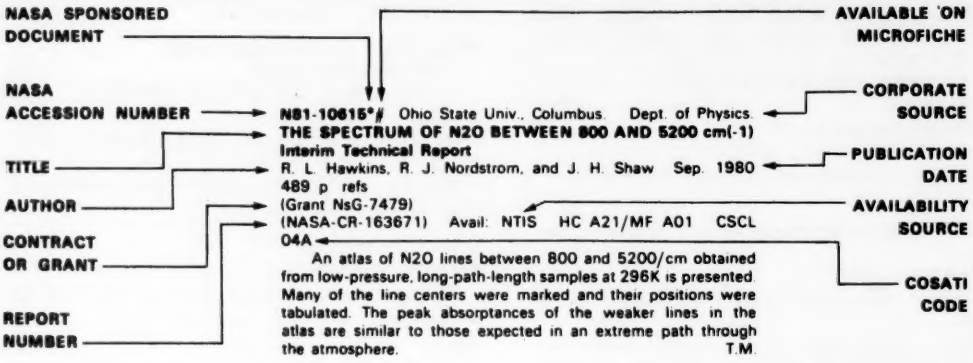
CORPORATE SOURCE INDEX I-69
CONTRACT NUMBER INDEX I-83
REPORT/ACCESSION NUMBER INDEX I-87

TYPICAL CITATION AND ABSTRACT


NASA SPONSORED DOCUMENT
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NASA ACCESSION NUMBER
N81-10615*# Ohio State Univ., Columbus. Dept. of Physics.
CORPORATE SOURCE
THE SPECTRUM OF N2O BETWEEN 800 AND 5200 cm(-1)
Interim Technical Report
TITLE
R. L. Hawkins, R. J. Nordstrom, and J. H. Shaw Sep. 1980
PUBLICATION DATE
489 p refs
AUTHOR
(Grant NsG-7479)
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(NASA-CR-163671) Avail: NTIS HC A21/MF A01 CSCL 04A
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REPORT NUMBER
An atlas of N2O lines between 800 and 5200/cm obtained from low-pressure, long-path-length samples at 296K is presented. Many of the line centers were marked and their positions were tabulated. The peak absorptances of the weaker lines in the atlas are similar to those expected in an extreme path through the atmosphere. T.M.

ON-GOING RESEARCH PROJECTS

This is a listing of research projects - not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power; Aircraft Stability and Control; and Research and Support Facilities (air). For Related Information See Also Astronautics.

1.0001, NUMERICAL SIMULATION OF SEPARATED FLOWS BY A VORTEX-TRACING ALGORITHM
D. Baganoff, Stanford University, School of Engineering, Dept. of Aeronautics & Astronautics, *Stanford, California* 94305 (NCA 2-745101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

1.0002, STUDIES OF FLIGHT DIRECTOR SYSTEMS FOR POWERED LIFT AIRCRAFT
A.E. Bryson, Stanford University, School of Engineering, Dept. of Aeronautics & Astronautics, *Stanford, California* 94305 (NCC 2-106)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

1.0003, 1980-81 CONFERENCE ON COMPUTATION OF COMPLEX TURBULENT FLOWS (PROCESSING OF EVALUATED FLOWS FOR DATA LIBRARY)
B.J. Cantwell, Stanford University, School of Engineering, Dept. of Aeronautics & Astronautics, *Stanford, California* 94305 (NAG 2-79)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

1.0004, NUMERICAL MODELING OF TURBULENT COMBUSTION
A.K. Oppenheim, University of California, Berkeley Campus, School of Engineering, Dept. of Mechanical Engineering, *Berkeley, California* 94720 (NAG 3-131)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

1.0005, STOCHASTIC CONTROL AND IDENTIFICATION OF HELICOPTER DYNAMIC MODES
Y. Bar Shalom, University of Connecticut, Storrs Campus, School of Engineering, Dept. of Electrical Engineering, *Box U-37, Storrs, Connecticut* 06268 (NAG 2-72)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

1.0006, SUPERCRITICAL AIRFOIL PERFORMANCE
D.E. Hobbs, United Technologies Corp., Pratt & Whitney Aircraft Group, *P.O. Box 2691, West Palm Beach, Florida* 33402 (DN890164; N00019-79-C-0229)

To provide experimental trailing edge aerodynamic information required for developing and verifying an analytical system for predicting exit air angle and total pressure loss for a supercritical airfoil. Experimental/analytical study.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

1.0007, INVESTIGATION OF THE PERFORMANCE IMPROVEMENTS WITH THE FREE-TIP ROTOR ON HELICOPTERS
T. Roskam, University of Kansas, Lawrence Campus, School of Engineering, Dept. of Aerospace Engineering, *Learned Hall, Lawrence, Kansas* 66044 (NCC 2-112)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

1.0008, DEVELOPMENT OF METHODOLOGY FOR COMPUTER-AIDED DESIGN AND MANUFACTURE OF WIND TUNNEL MODEL COMPONENTS
W.G. Schweikhard, University of Kansas, Lawrence Campus, School of Engineering, Dept. of Aerospace Engineering, *Learned Hall, Lawrence, Kansas* 66044 (NCC 2-107)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

1.0009, CALIBRATION LABORATORY DEVELOPMENTS FOR PROPULSION SIMULATORS
W.G. Schweikhard, University of Kansas, Lawrence Campus, School of Engineering, Dept. of Aerospace Engineering, *Learned Hall, Lawrence, Kansas* 66044 (NCC 2-110)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

1.0010, TRAINING PROGRAM IN COMPUTATIONAL FLUID DYNAMICS
E.M. Murman, Massachusetts Inst. of Technology, School of Engineering, Dept. of Aeronautics & Astronautics, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (NGT 22-009-901)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Aeronautics & Space Technology

1.0011, VORTICITY MEASUREMENTS IN A FORCED PLANE SHEAR LAYER
J.F. Foss, Michigan State University, School of Engineering, Dept. of Mechanical Engineering, *Engineering Bldg., East Lansing, Michigan* 48824 (NAG 2-86)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

1.0012, NUMERICAL CALCULATION OF TRANSONIC FLOWS PAST COMPLEX AERODYNAMIC CONFIGURATIONS
A. Jameson, Princeton University, School of Engineering & Applied Sciences, Dept. of Mechanical & Aerospace Engineering, *Box 430, Princeton, New Jersey* 08540 (NAG 2-96)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

1.0013, DEVELOPMENT OF A COMPREHENSIVE RDT/E PROGRAM FOR GROUND SUPPORT EQUIPMENT

M. Palamar, U.S. Dept. of Defense, Navy, Naval Air Engineering Center, *Lakehurst, New Jersey* 08733 (DN133406)

To develop a systematized RDT/E program which will define and integrate future ground support requirements with a comprehensive RDT/E effort insuring an optimal operational support capability for future generation aircraft and weapons systems.

Develop a detailed identification of the testing, servicing, maintenance, and handling functions necessary to support aircraft and associated directives, along with organizational structure for the planning and managing of GSE RDT/E. Develop and implement systematic measures to insure prompt consideration of ground support equipment requirements which may be introduced by advancements in airborne systems, changes in support technology, or changes in the operational environment. Develop a long-range plan for GSE RDT/E to parallel aircraft systems and technology forecasts.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

1.0014, EXPERIMENTAL STUDY OF TURBULENCE IN BLADE END-WALL CORNER REGION

R. Raj, City University of New York, City College, School of Engineering, Dept. of Mechanical Engineering, *Convent Ave. & 138th St., New York, New York* 10031 (NAG 3-122)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

1.0015, INTERACTIVE CALCULATION PROCEDURES FOR MIXED COMPRESSION INLETS

E. Reshotko, Case Western Reserve University, School of Engineering, Dept. of Mechanical & Aerospace Engineering, *University Cir., Cleveland, Ohio* 44106 (NAG 3-140)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

1.0016, REMOTE AUGMENTOR LIFT SYSTEM (RALS)/VARIABLE CYCLE ENGINE (VCE) TRADE STUDY

W.S. Willis, General Electric Co., Aircraft Engine Group, *1 Jimson Rd., Cincinnati, Ohio* 45215 (DN889789; N00140-79-C-0008)

Determine the effect of turbine inlet temperature and design complexity on the thrust/weight ratio, performance, and life-cycle cost of a RALS/VCE system.

This study program is a GE-contracted effort which utilizes the GE 3200 F double-bypass 'D' series RALS/VCE developed under contract N00140-75-C-2034 as the baseline system for comparison. The effort consists of the development of eight additional detailed mechanical and thermodynamic engine designs: a 2900 degree and a 2600 degree double-bypass RALS/VCE; a 3200 degree, a 2900 degree, and a 2600 degree single-bypass RALS/VCE; and a 3200 degree, a 2900 degree, and a 2600 degree fixed-cycle RALS turbofan. The program compares the computed aircraft takeoff gross weight of each of the eight engine/aircraft combinations to the baseline system utilizing aircraft sensitivity data supplied to GE by McDonnell Aircraft Company under separate Navy contract N00140-75-C-0034 as part of the VCE selection program. The final task is the identification of propulsion system impact on life-cycle cost for each engine configuration.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Propulsion Test Center

1.0017, J-79 B/AL FOD IMPACT TRANSIENT STRESS ANALYSIS

T.G. Fecke, U.S. Dept. of Defense, Air Force, Aero Propulsion Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF460190)

The objective of this program is to establish a foreign object damage (FOD) transient stress analysis prediction model. Computer support services shall be required to conduct an in-house transient analytical simulation of starlings impacting J-79 B/Al composite blades.

The composite blades shall be modeled utilizing the NASTRAN finite element computer program due to the availability of a transient analysis capability. Stress/strain failure modes of the composite blades will be identified. Two-dimensional bird impact loading functions developed from paralleling J-79 B/Al contractual studies shall be input to the finite element model as a function of the chord distance and impact time. The actual three-dimensional J-79 B/Al blade will be modeled using NASTRAN and both isotropic and orthotropic material property models of the blade shall be analyzed. The experimental data obtained under the FOD improvement program being completed at General Electric shall be used for comparisons with the finite element analytical results to define the reliability of these analytical methods.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

1.0018, ADVANCED FIRE, EXPLOSION AND OVERHEAT DETECTION CONCEPTS FOR AIRCRAFT

D.G. Fox, U.S. Dept. of Defense, Air Force, Aero Propulsion Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF451630)

To select a multiplexing technique - pulse code modulation (PCM), pulse amplitude modulation (PAM), etc. - and determine the most optimum method for using all available hazards sensors to inform crew members of the type, location and size of hazard and what should be done about it. To directly digitize and address transducers so that interrogation by the multiplexer can be direct and efficient. A flight-qualified system capable of providing rapid collated instructions and information to crew members is the goal of this program.

A method will be established and confirmed by experiments whereby the boundary layer behavior along the semiporous blade surface can be calculated and the surface temperature variations predicted. The fluid dynamic and thermodynamic conditions surrounding a single moving blade will be studied and used to predict the peak temperatures of moving blades and the location of these peaks.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

1.0019, ALTERNATE FUELS COMBUSTION INVESTIGATIONS

T.A. Jackson, U.S. Dept. of Defense, Air Force, Aero Propulsion Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF458210)

Expanded-specification petroleum fuels and fuels from oil shale and coal are being considered for future use in Air Force aircraft. The objective of this effort is to examine and quantify the effects of appropriate fuel character changes on the engine combustion systems. These findings will be used as bases for decisions regarding (a) the extent to which current systems can tolerate changes in fuel quality, (b) future modifications to combustion systems to allow use of reduced quality fuels, and (c) the trade-off of fuel processing cost versus the cost of modified combustor designs.

A sophisticated Raman system to measure exhaust pollutants from an aircraft engine was developed on an AFAPL contract. It is now apparent that this system has many capabilities which can be utilized for combustion diagnostic purposes. For example, it can determine time-averaged temperature and specie concentration measurements, it has been hardened to operate in the adverse environment of a jet engine, Raman Stokes and anti-Stokes, MIE and Rayleigh scattering and fluorescence can be detected, and point measurements rather than integrated absorption methods can be accomplished. The approach is to apply this Raman system to a variety of different practical combustion problems. System capabilities and limitations will be determined in the following applications: exhaust plane temperature and species mapping, after-burner efficiency measurement, main burner pattern factor measurement, and main burner temperature and species mapping.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

1.0020, INVESTIGATION OF AIR FORCE FIGHTER AIRCRAFT FLIGHT CONTROL SYSTEMS TO DETERMINE ACCURACY IN AIR-TO-GROUND WEAPON DELIVERY

J.J. Bankovskis, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF124850)

The contribution of the flight control system to the achievement of weapon system delivery accuracies will be investigated to determine significant interactions with the fire control systems. Specific aspects such as handling qualities, control system augmentation, pilot work load and display will be considered.

The program will involve three tasks: Task I - the study and evaluation of the provisional signal standard published by RTCA SC-117 and the total national program plans to assure satisfaction of USAF requirements. Task II - the study of all proposals for concept validation programs to assess the merits of each and provide technical inputs to the USAF validation program. Task III - the study and evaluation of low-cost and alternate techniques to satisfy USAF tactical requirements.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0021, ADVANCED REMOTELY PILOTED MODULAR AIRCRAFT (ARPMA) STUDIES

D.R. Burnett, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF133700)

Advanced operational multi-mission remotely piloted vehicles (RPVs) must have the capability to perform several different missions, employing vastly different special mission equipment. This requirement necessitates an airframe of modular design to accomodate rapid interchange of aerodynamic surfaces, launch and recovery equipment, and primary mission equipment modules. The objective of this program is to perform conceptual design studies leading to the design of an advanced modular technology demonstrator RPV.

Existing super-boom prediction codes will be modified to accept rapidly keyed-in pilot or pre-flight instruction as well as weather data (winds, departures from standard). Existing as well as new system geometries will be cast in suitable form (with an equivalent body function). A data base for selected systems under simulated mission conditions will be generated. Program will detect magnitude and location of super-boom and accordingly select alternate mission profiles.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0022, H.E. PROJECTILE PROTECTION DESIGN CRITERIA VALIDATION

G.W. Ducker, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF141800)

Most of the source material used in the development of the general specification and design guide of contract F33615-76-C-3006 is unverified or derivative information. This work unit will provide direct verification of the contents of these documents, or the basis for their revision. This will insure that the documents are both effective and sufficient for their intended use. The objective of this work unit is to evaluate the design guidance developed under this contract, validate the requirements and design procedures delineated in the documents and define any necessary modifications. The result of this work effort will be assurance that the standardization documents are adequate for procurement and design, and that the protection requirements are sufficient.

A test plan will be prepared which will reflect the requirements established in the system specification. Test specimens will be prepared in accordance with the design guide. Ballistic tests will be performed in the aircraft survivability research facility. The results will be analyzed and appropriate modifications made, as necessary, to the specification and design guide developed under the referenced contract.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0023, INTEGRATED REAL-TIME INFORMATION PROCESSING THEORY

S.J. Larimer, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF144630)

This work unit supports mission FGO4A, control system architecture. Military aircraft are becoming more sophisticated and complex, requiring the management of ever-increasing amounts of real-time information about the state of the aircraft and its environment. This information, if processed and distributed properly, can be used to provide more effective systems by allowing more sophisticated control laws, improved pilot interfaces, increased survivability, more efficient navigation, more accurate weapons delivery, more versatile redundancy management, and more positive command and control. The objective of this effort is to develop concepts, architectures, algorithms, and approaches for processing and distributing the total aircraft system state information. This will reduce the complexity, increase reliability, and reduce cost of future flight control systems in military aircraft.

Identify all sources and uses of state and environment information in military aircraft. Investigate architectures and algorithms for integrating the processing of this information for distribution to all aircraft systems.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0024, LAMINATED WING STRUCTURES

J.B. Monfort, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF140090)

There is a continuing need to reduce costs and improve the structural efficiency of advanced military aircraft. Conventional design and construction techniques have been virtually pushed to their limits, with further improvements dependent almost entirely upon development of new alloys and material systems. The objective of this effort is to evaluate innovative design and fabrication techniques wherein additional system advantage can be achieved through laminating aluminum sheet by adhesive bonding to reduce acquisition and life-cycle costs concurrently with weight savings and increased damage tolerance of primary airframe structure. The combination of economic and performance benefits realizable from improved airframes will provide the Air Force with a valuable tool for accomplishing the assigned mission with critical resources.

The Air Force Flight Dynamics Laboratory and the Air Force Materials Laboratory are jointly sponsoring contract F33615-75-C-5178 with General Dynamics/Forth Worth, MASIS Accession Number 678180, to design, fabricate and evaluate an adhesively bonded, laminated aluminum stub wing box based on the F-16 design criteria. As an integral part of this program three such wing boxes will be tested by the AFFDL, with non-destructive evaluation support from AFML, at Wright-Patterson AFB for static strength, fatigue and damage tolerance. All data and the wing boxes shall be returned to the contractor for analysis and inclusion of results in their final technical report.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0025, INTEGRAL FUEL TANK TEST METHODS AND CRITERIA

M.D. Richardson, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF143150)

This effort will help to insure increased safety and more cost-effective operation of future USAF aircraft. Current data retrieval systems have identified fuel leaks from aircraft integral fuel tanks as a high-cost item. These costs are incurred directly by the maintenance required to repair leaks and return the aircraft to flight status, and indirectly by the reduction in aircraft availability. The Air Force specification, MIL-S-8867, requires very little fuel tank testing and contractors do very little. The goal of this effort will be to develop a cost-effective method(s) of adequately certifying new aircraft with integral fuel tanks for fuel containment. As part of this goal a criterion defining ade-

quate fuel containment will be established. The impact of effective test methods on such design parameters as cost, weight, materials and configuration can be significant. Accomplishment of this objective will permit economical and efficient operation of future USAF aircraft with respect to repairs necessitated by fuel system leaks.

Review current structural and dynamic test criteria. Determine scale and configuration of specimens needed. Develop test techniques to realistically simulate static and dynamic loads and related environments.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0026, CORRELATION OF TRANSONIC-CONE PRESTON-TUBE DATA AND SKIN FRICTION
T.D. Reed, Oklahoma State University, School of Engineering, Dept. of Mechanical & Aerospace Engineering, *Engineering N., Stillwater, Oklahoma* 74074 (NAG 2-76)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

1.0027, THREE-DIMENSIONAL BOUNDARY LAYER FLOW OVER TRANSONIC SLOTTED WIND TUNNEL WALL WITH MASS TRANSFER
J.M. Wu, University of Tennessee, Knoxville Campus, School of Engineering, Dept. of Mechanical & Aerospace Engineering, *W. Cumberland Ave. S.W., Knoxville, Tennessee* 37916 (NAG 2-71)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

1.0028, DEVELOPMENT OF ANALYTICAL PROCEDURES FOR HELICOPTER ROTOR TIP AERODYNAMICS
G.F. Hall, Texas A & M University, College Station Campus, School of Engineering, Dept. of Aerospace Engineering, *P.O. Box F E 44, College Station, Texas* 77843 (NCA 2-773101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

1.0029, BALLISTIC RANGE OPERATION AND GENERAL MAINTENANCE
E.M. Pard, U.S. Dept. of Defense, Army, Aviation Research & Development Command, Applied Technology Lab., *Fort Eustis, Newport News, Virginia* 23604 (DA0B4016)

To operate, maintain, and provide instrumentation to support the ballistic testing of experimentally designed and fabricated concepts that are intended to increase the survivability of Army aircraft.

Provide continuous ballistic/instrumentation support for in-house and contractural efforts. Ballistic support is provided in conjunction with developing, testing, and evaluating experimental materials and systems that increase the survivability of Army aircrews and aircraft.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Applied Technology Lab.

1.0030, ADVANCED STRUCTURAL ELEMENT DEVELOPMENT
D.M. Saylor, U.S. Dept. of Defense, Army, Aviation Research & Development Command, Applied Technology Lab., *Fort Eustis, Newport News, Virginia* 23604 (DA0G2934; N/A)

To develop advanced structural design concepts which will provide improvements in structural efficiency, safety and survivability, and reliability and maintainability. This effort will assure that the Army has the most up-to-date technology available to perform its mission in an efficient manner. Emphasis will be placed on developing new concepts to improve the structural performance and reduce the acquisition and life-cycle cost of aircraft structures.

Material specimens of solimide will be tested to determine material properties. Additional spaceweave cylinders will be fabricated to determine optimal spacing of fiber bonds to give best ballistic damage survivability. A data base management system will be developed to provide rapid access to material properties of materials and adhesives currently used in Army aviation research and development.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Applied Technology Lab.

1.0031, CHARACTERIZATION OF GAS TURBINE COMBUSTOR NOISE SOURCES FROM FAR-FIELD MEASUREMENTS
J.R. Mahan, Virginia Polytechnic Inst. & State University, School of Engineering, Dept. of Mechanical Engineering, *Blacksburg, Virginia* 24061 (NAG 3-124)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

1.0032, ANALYTICAL AND EXPERIMENTAL EVALUATION OF SUPERIMPOSED PREDICTOR SYMBOLOGY FOR COMPUTER-GENERATED REAL-WORLD DISPLAY
A.J. Grunwald, Technion, *Haifa, Israel* (NASW 3302)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

ASTRONAUTICS

Includes Astronautics (general); Astrodynamics; Ground Support Systems and Facilities (space); Launch Vehicles and Space Vehicles; Space Transportation; Spacecraft Communications; Command and Tracking; Spacecraft Design, Testing, and Performance; Spacecraft Instrumentation; and Spacecraft Propulsion and Power. For Related Information See Also Aeronautics.

2.0001, LIFETIME ANALYSIS OF GEOSYNCHRONOUS
P.E. Nacozy, University of Texas, Austin Campus, School of Engineering, Dept. of Aerospace Engineering & Engineering Mechanics, *200 W. 21st, Austin, Texas* 78712 (NAS 9-16308)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lyndon B. Johnson Space Center

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, CHEMICAL RELEASE MODULE FACILITY ANNOUNCEMENT OF OPPORTUNITY EVALUATION
Unknown, University of Alabama in Huntsville, Graduate School, *Huntsville, Alabama* 35807 (NAS 8-34365)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

3.0002, DISLOCATION VELOCITY AND MULTIPLICATION PRODUCED BY PLANE WAVE LOADING
T. Vreeland, California Inst. of Technology, Graduate School, Dept. of Materials Science, *1201 E. California Blvd., Pasadena, California* 91109 (DMR77-21756)

The objective of this investigation is to develop an understanding of high dislocation velocity behavior. High-rate plastic deformation which occurs under shock loading conditions is the result of the high velocity motion and subsequent multiplication of dislocations. Fundamental to an understanding of high-rate plastic deformation is a knowledge of the stress-velocity relationship for dislocations at velocities near that of elastic shear waves. Two methods have been devised to effect short-duration pulse loading - high energy laser pulses and impact of a thin mylar plate. The short duration of the stress pulse (approximately one-quarter-microsecond) will limit the dislocation displacement so that the dislocations of interest do not pass out of the test crystal. The crystal is at rest after the stress pulse so that no additional stress need be applied in the course of its recovery.

This is a renewal of NSF Grant DMR74-01124 A01. This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

3.0003, LONG-TERM INFLUENCE OF PHYSICAL AGING PROCESSES IN EPOXY MATRIX COMPOSITES

K. Heinemann, Stanford University, School of Engineering, Dept. of Materials Science & Engineering, *Stanford, California* 94305 (NCC 2-103)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

3.0004, POLYMER CHARACTERIZATION

W.B. Moniz, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN880007)

The objective of the research is to devise and perfect new instrumental techniques for the characterization of polymeric materials. The goal is improved quality control, reliability, and durability test criteria for Navy materials, such as structural polymers and adhesives, elastomers, and propellant binders.

New techniques for polymer characterization are developed, with emphasis on magnetic resonance and other instrumental methods. The techniques are evaluated and optimized with respect to their utility in analyzing polymer composition or behavior.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

3.0005, MICROBIAL DETERIORATION OF SYNFUELS

R.A. Neihof, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN880092)

To assess the susceptibility of jet fuels derived from oil shale, tar sands and coal to infestation and deterioration by microorganisms. To identify fuel constituents contributing to microbial growth promotion and to examine ways of preventing such growth.

Test units will be set-up containing two phases - a synthetic fuel and a fresh or sea water medium. Bacteria, fungi and yeast known to be prevalent in fuel tanks will be used for inoculation. The test systems will be monitored during a period of 6 months to determine microbial activity and changes in the chemical and physical properties of the fuels. The appearance of any unusual microbial growth will be traced to the fuel constituents responsible.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Propulsion Test Center

3.0006, OPTICAL PROPERTIES OF MATERIALS

H.B. Rosenstock, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN620095)

The objective of this work is to carry out the underlying theory and experiments concerning materials of interest to the Navy. Emphasis is currently placed on determining the physical origin of the attenuation in weakly absorbing materials which may be employed in high power laser windows, thin films, atmospheric gases, and fiber optics, but other applications are also studied as they arise.

The mid- and long-term Navy material needs are periodically assessed and research is undertaken to fulfill those needs deemed most critical and for which investigation seems most likely to result in solution of these needs. In the past, this has concentrated on laser windows. At present, the ultimate limitation on laser propagation through atmosphere is also studied.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

3.0007, CHEMISTRY OF FUELS FROM ALTERNATE SOURCES

J.R. McDonald, U.S. Dept. of Defense, Navy, Naval Research Lab., Chemistry Div., *Washington, District of Columbia* 20375 (DN080088)

To acquire a technology base relating to the composition, storage, handling and combustion of liquid fuels from alternate sources such as shale and coal, which will allow the Navy to integrate these fuels into fleet operation with a minimum of serious side-effects.

Synthetic fuels from shale and coal will be separated into fractions and analyzed to specifiy minor components. Fuels and model fuels will be thermally stressed and analyzed to determine conditions for storage, handling, and use. These studies will also define model fuels for combustion studies. Basic studies will determine chemical reactions and mechanisms which lead to nitrogen oxide and sooting in fuel combustion. This will involve studies in a variety of static and flowing reactors and in a high-temperature shock tube. Shock tube studies will provide chemical data for combustion modeling to be carried out jointly with the laboratory for computational physics.

SUPPORTED BY U.S. Dept. of Defense, Naval Research Lab., Material & Rad Science & Tech Directorate

3.0008, NUCLEAR SPIN-LATTICE RELAXATION STUDIES AND THEIR APPLICATION TO CHEMICAL PROBLEMS

G.C. Levy, State University System of Florida, Florida State University, School of Arts & Sciences, Dept. of Chemistry, *205 Wildwood Dr., Tallahassee, Florida* 32306 (CHE76-81738)

A high-sensitivity 21-35 kilogauss multi-nuclei Fourier transform NMR spectrometer is under construction, and will make possible measurements of the spin-lattice relaxation time and nuclear Overhauser effect in natural abundance N-15 and dilute natural abundance carbon-13 samples. Liquid dynamics, structure, and intramolecular segmental motions will be investigated for polymer systems. Small molecules associated with polymers, solvated ion pairs, and hydrogen bonding in systems containing OH and NH groups will also be studied, including investigations of the effects of variation in concentration. The effects of paramagnetic relaxation reagents on nitrogen-15 nuclei will also be studied. Models of translational diffusion processes in liquids will be tested. This research represents a continuation of that currently supported by CHE-7400332.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0009, STRUCTURE OF GRAIN BOUNDARIES

R.W. Balluffi, Massachusetts Inst. of Technology, School of Engineering, Dept. of Materials Science & Engineering, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (DMR78-12804)

This is a basic investigation of the detailed atomic structure of grain boundaries. The atomic configuration in bi-crystals of gold will be modelled by computer simulation. The experimental work will be done by S. Sass of Cornell University. The research to be undertaken will include: (1) determination of the grain boundary core structure: the atomic structure of the core of a range of boundaries of different angles will be calculated by computer simulation; the X-ray structure factors will then be calculated and compared with measurements of the diffraction from boundaries of these same types performed by Sass at Cornell; (2) determination of the core structure of grain boundary dislocations (GBDs) of different angles: the structure of the core of GBDs in a range of boundaries will be calculated; the electron diffraction contrast produced by the GBDs will be calculated and compared with the experimentally observed contrast from GBDs of the same type; and (3) determination of the anisotropy of the boundary energy and the occurrence of faceting: systematic observations of the faceting of a series of predetermined boundaries will be made; computer calculations of the corresponding boundary structures and energies will then be made, and predictions of faceting will be made and compared with experiment. The initial calculation can be extended to grain boundaries in other materials, both pure elements and alloys. It

is expected that the results of this research will enhance significantly our understanding of the nature of grain boundaries. This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

3.0010, HOT-PRESSING CERAMICS FOR ADVANCED HEAT ENGINES

G.E. Gazza, U.S. Dept. of Defense, Army, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center, *Watertown, Massachusetts* 02172 (DA0E4741)

The objective of this work is to develop improved fabrication parameters (lower temperature, shorter time) for hot-pressing Si3N4 while maintaining or increasing material properties. Also, to hot-press, to near net shape, Si3N4 engine components for use in the 'Adiabatic Diesel Engine Program' sponsored by TARADCOM.

To use uniaxial hot-pressing for specimen fabrication and producing shaped components. Correlate changes in starting material and hot-pressing parameters with resultant properties (strength, fracture toughness), microstructural characteristics and phase analysis. Also, fabricate Si3N4 shaped components using contoured plungers and techniques as previously developed. Engine-test the components in experimental diesel engines at Cummins.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, *Materials & Mechanics Research Center*

3.0011, STABILITY AND CHARACTERIZATION OF *PHASES IN THE Si-Al-O-N SYSTEM*

J.W. McCauley, U.S. Dept. of Defense, Army, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center, *Watertown, Massachusetts* 02172 (DA0F4818)

Advanced guided missiles will probably utilize multimode guiding techniques, including infrared and millimeter wave and microwave radars. Further, the multimode windows should be able to perform in severe erosion and threat (laser) environments. Materials based on oxygen and nitrogen frameworks could possibly satisfy these requirements with simplified processing conditions. The thrust of this program is to critically evaluate selected oxy-nitride systems for new materials which may solve the complex, multimode requirements for missile guidance structural windows and domes. Pacing material problems - radomes -thrust - technology gap.

Systematic broad-based phase equilibria studies will be carried out in selected chemical systems. Initially the aluminum oxide, aluminum nitride system will be studied followed by the ternary system with silicon nitride added. The sintering and property characteristics of the two nitrogen-stabilized cubic aluminum oxides will be critically evaluated.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center

3.0012, IMPROVED REACTION-SINTERED CERAMICS FOR ENGINES

D.R. Messier, U.S. Dept. of Defense, Army, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center, *Watertown, Massachusetts* 02172 (DA0G4699)

The objective of this program is to develop improved, economical ceramic materials for future Army power generation and propulsion applications. Although this work is specifically related to the use of ceramic components in the MERADCOM 10 kW turboalternator, it also relates to pacing materials problems in aricraft (turbine components 14.2, 15.2, 15.7, 15.11 in FY76 guidance), armored vehicles (combustor, power turbine, and regeneration for 1370 degrees C TIT), and problems in surface mobility and craft and missile materials. The major thrust is cost reduction via fuel economy.

Although reaction-sintered silicon nitride is attractive as an inexpensive, fabricable material for use in the nozzle and combustion chamber sections of the 10 kW turboalternator, its resistance to erosion and oxidation appears marginal for such use. A recently developed coating technique appears promising for overcoming these deficiencies. It has been shown that precoating porous silicon nitride with titanium enhances its wetting by silicon at elevated temperatures (Ca 1430 degrees C), providing a means of obtaining impervious coatings of silicon on silicon nitride. The coatings may be used as they are, or with nitride to form dense silicon nitride coatings. The coating process will be optimized, coating properties will be characterized and, subsequently, vanes will be coated for testing in the MERADCOM 10 kW turboalternator.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center

3.0013, *CHEMICAL AND ELECTROCHEMICAL ASPECTS OF THE CHROMIC/CHROMOUS ELECTRODE REACTION IN THE NASA-REDOX ENERGY STORAGE SYSTEM*

D.A. Johnson, Spring Arbor College, Undergraduate School, *106 Main St., Spring Arbor, Michigan* 49283 (NAG 3-148)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

3.0014, OPTICAL/ELECTROMAGNETIC CHARACTERISTICS OF COLD *REGIONS MATERIALS*

H.W. O'Brien, U.S. Dept. of Defense, Army, Corps of Engineers, Cold Regions Research & Engineering Lab., *P.O. Box 282, Hanover, New Hampshire 03755 (DA0D8152)*

To support the 'DOD Plan for Atmospheric Transmission Research and Development' and the DARCOM program relating to 'The Use of Realistic Battlefield Conditions Throughout the Army' by providing fundamental information concerning (a) the electrooptical characteristics of snow cover as a target background and of airborne snow and cold fog as obscuring aerosols, and (b) the dielectric properties of snow, ice and frozen soil surfaces under various cold regions conditions.

Study the spectral reflectance and transmission characteristics of snow and the effect of fog/snow obscuration. Interpret results of laboratory and field measurements. Determine in situ dielectric properties in the VHF and UHF bands of snow, ice and frozen soils through measurements of groundwave wave-tilt and field strength attenuation. Disseminate results to users to provide a basis for improved design and performance of materiel. Foreign state-of-the-art is being considered.

SUPPORTED BY U.S. Dept. of Defense, Corps of Engineers, Cold Regions Research & Engineering Lab.

3.0015, ADVANCED PROCESSING OF MAGNESIUM *ALLOYS*

M. Kumar, U.S. Dept. of Defense, Army, Armament Research & Development Command, Fire Control & Small Caliber *Weapon Systems Lab., Picatinny Arsenal, Dover, New Jersey* 07801 (DA0B0678)

The overall objective is to improve the formability and toughness of magnesium alloys through the use of advanced processing techniques. This work is directed towards the technology area of aircraft with a major thrust of skins/structures components.

Selected commercially wrought magnesium alloys will be evaluated for their potential for superplastic forming. Advanced powder/metallurgy techniques will be used to develop magnesium alloys with increased fracture toughness.

SUPPORTED BY U.S. Dept. of Defense, Armament Research & Development Command, Fire Control & Small Caliber *Weapon Systems Lab.*

3.0016, THERMAL STABILITY OF HYDROCARBON *FUELS*

C.J. Nowack, U.S. Dept. of Defense, Navy, Naval Air Propulsion Test Center, Fuels Lubes & Power Drive *System Group, 1440 Pkwy. Ave., Trenton, New Jersey* 08628 (DN889801)

To determine the relationship between fuel properties and thermal stability of synthetic and petroleum jet fuels.

Perform thermal degradation tests of fuel samples with controlled chemical composition using the jet fuel specification test procedure as well as actual aircraft hardware. Correlate the stability of the fuels with the chemical composition.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Material Command

3.0017, ADHESION OF ICE FROM HELICOPTER ROTOR BLADES AND AIRCRAFT WINGS

H.H. Jellinek, Clarkson College of Technology, School of Arts & Sciences, Dept. of Chemistry, *51 Main St., Potsdam, New York* 13676 (NAG 3-145)

SUPPORTED BY U.S. National Aeronautics & Space Admin., *Lewis Research Center*

3.0018, DIFFRACTION STUDIES OF GRAIN BOUNDARY STRUCTURES IN FACE-CENTERED-CUBIC METALLIC MATERIALS

S.L. Sass, Cornell University, Ithaca Campus, School of Engineering, Dept. of Materials Science & Engineering, *242 Carpenter Hall, Ithaca, New York* 14853 (DMR79-16331)

This is an X-ray diffraction investigation of the structure of large angle grain boundaries in face-centered-cubic (FCC) metals. During the previous funding period, an X-ray technique *was developed to measure the thickness of the grain boundary* (GB) regions, electron diffraction techniques were developed to study the GB of polycrystalline materials, and the atomic structure *of twist and tilt boundaries was determined. These tech*niques will now be employed to determine: 1) large GBs in Au, Ag, Pt, Pd, Ou, Ni, and Al; 2) GB thickness and its relationship to boundary structure; 3) the effect of alloying on the structure of GBs; 4) the effect of segregation of solute atoms on GB structure; and 5) structure of GBs as a function of temperature, to find evidence for the postulated grain boundary phase transformation. Several of these studies will be done using the Cornell High Energy Synchrotron Source. This is an extension of research previously supported by NSF Grant DMR 76-24180 A02. This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

3.0019, RELATING NMR PARAMETERS TO POLYMER MECHANICAL PROPERTIES

W.M. Ritchey, Case Western Reserve University, School of Science, Dept. of Chemistry, *2165 Adelbert Rd., Cleveland, Ohio* 44106 (NAG 3-158)

SUPPORTED BY U.S. National Aeronautics & Space Admin., *Lewis Research Center*

3.0020, THE INFRARED SPECTRUM OF GASEOUS GEH4

R.W. Lovejoy, Lehigh University, School of Arts & Sciences, *Dept. of Chemistry, Alumni Memorial Bldg., Bethlehem, Pennsylvania* 18015 (NCA 2-380101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

3.0021, RADAR TRANSPARENT RIGID POLYURETHANE POLYMER AND COMPOSITES FOR RADOMES

H.J. Lee, U.S. Dept. of Defense, Navy, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate, *Warminster, Pennsylvania* 18974 (DN881429)

To increase for radome application the radar frequency transmission of the rigid polyurethane polymer composite by reducing its dielectric constant (dc) to 3.0 or lower without sacri*ficing other properties. To reduce presently required thickness* of radomes by providing a significant increase in strength and modulus of elasticity coupled with improved radar frequency *transmission over materials currently under development. Due* to recent and continuing advances in aircraft technology there exists a need for optimization because of increasing demands on all-weather radome performance.

Modify the structure of NADC-developed polyurethane polymer X530 by synthesizing to increasing degrees of polymerization and/or by inclusion of chemical substituents that would *lower the polarity of the molecule and the dielectric constant.* Develop new composites with quartz cloth at various resin-quartz ratios to determine composition that would give the opti*mum electrical and structural properties. Also, conduct experi*ments to determine to what degree the electrical and structural properties of the polymer and a quartz composite will be in*creased for possible substitution of existing materials for the* radome application.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

3.0022, INVESTIGATIONS INTO THE INJECTION MOLDING OF PMR15 POLYIMIDE

S.C. Malguarnera, Texas A & M University, College Station Campus, School of Engineering, Dept. of Mechanical Engineering, *P.O. Box F E 44, College Station, Texas* 77843 (NAG 3-129)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

3.0023, ELECTRONIC STRUCTURE OF SUBSTOICHIOMETRIC TRANSITION METAL OXIDES

J.W. Rabalais, University of Houston, School of Natural Sciences & Mathematics, Dept. of Chemistry, *3801 Cullen Blvd., Houston, Texas* 77004 (E-656)

Cs2 (plus) has been measured in SIMS of KCl-CsCl solid solutions in which (Cs)/(K2) varies from 10 to the minus first power to 10 to the minus fifth power. The data indicate that there is a maximum clustering distance, i.e., Cs-Cs distance, above which Cs2 (plus) is not formed. This distance is approximately 200 A degrees and approximately 400 A for He (plus) and Ar (plus) primary ions, respectively, and is independent of primary energy over the range of 0.2 to 3.0 keV. The results are *consistent with a mechanism in which bound secondary clusters* consisting of atoms from contiguous as well as noncontiguous lattice sites are formed through potential interactions during ir*reversible adiabatic expansion of an activated region near the* surface surrounding the impact site. Photoemission studies of the clean (0001) face of a titanium single crystal using UV and X-*ray photoelectron spectroscopy (UPS and XPS) have revealed a* surface-sensitive electronic state in the valence band. The maximum in the valence band density of states is approximately 0.5 eV below the Fermi level and the surface-sensitive state is at approximately 1.4 eV. The photoionization cross-section of this surface state decreases rapidly as incident photon energy increases. The state exhibits extreme sensitivity to contamination; CO and N2 are dissociatively chemisorbed selectively by this state while O2 is dissociatively sorbed by both this state and the d-band to form titanium oxide. A strong temperature dependence is exhibited by this state; its intensity decreases rapidly *upon heating from approximately 120 degrees C to approximate*ly 240 degrees C where its UPS intensity is quenched.

SUPPORTED BY Robert A. Welch Foundation

3.0024, NEW EXPERIMENTS IN PULSED NUCLEAR MAGNETIC RESONANCE

C.G. Wade, University of Texas, Austin Campus, School of Natural Sciences, Dept. of Chemistry, *200 W. 21st St., Austin, Texas* 78712 (F-370)

Measurements of proton spin lattice relaxation (T1), rotating frame relaxation (T1p) and linewidths are in progress on octaphenylcyclotetrasiloxane (OPCTS), a compound suspected of possibly having an unusual high-temperature mesophase *which is not a liquid crystal phase and not a plastic crystal* phase. The phase in question shows only one Bragg peak and pronounced diffuse scattering between 188 degrees C and 205 *degrees C. For this a special high-temperature probe was con*structed capable of NMR measurements up to 200 degrees C. The initial NMR results indicate the mesophase supercools to *nearly room temperature and cannot be oriented by the magnet*ic field (7500 Oersteds). A careful study of the effects of cholesterol on lipid diffusion in dipalmitoyl/D2O model membrane *multilayers has been made. The D2O concentration was held*

constant at 20 weight %, and the cholesterol to lipid ratio was varied from 0.0 to 30%. Below 10% the diffusion increases with cholesterol concentrations; above about 10%, the diffusion rate decreases with increasing cholesterol concentration. Depending on the technique used increases in diffusion at low cholesterol concentrations have been found by some investigators while others have found decreases. The discrepancies are partially explained by differing time-scales of the various experiments.

SUPPORTED BY Robert A. Welch Foundation

3.0025, FRACTURE OF METALS AND ALLOYS

H.G. Wilsdorf, University of Virginia, School of Engineering & Applied Science, Dept. of Materials Science, *Garrett Hall, Charlottesville, Virginia* 22903 (DN023110; N00014-75-C-0855)

The goal of this research is to gain a better understanding of crack propagation and fracture processes occurring in metals and alloys in order to help develop reliable, crack-resistant alloys needed in advanced naval systems.

Crack propagation and fracture of various metals and alloys are being observed directly in a 500 kV electron microscope. This allows dislocation interactions and fracture processes to be observed on a near-atomic scale. Correlation of experimental observation with theoretical fracture analyses is being undertaken.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0026, DETERMINATION OF STIFFNESS REDUCTIONS DURING FATIGUE OF UNNOTCHED, ANGLE-PLY GRAPHITE/EPOXY LAMINATES

D.F. Adams, University of Wyoming, School of Engineering, Dept. of Mechanical Engineering, *P.O. Box 3435, University Station, Laramie, Wyoming* 82070 (NAS 1-16557)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, DYNAMICALLY AIMED FREE FLIGHT ROCKET (TMP109)

G. Batiuk, U.S. Dept. of Defense, Army, Missile Research & Development Command, Systems Simulation & Development Directorate, *Redstone Arsenal, Huntsville, Alabama* 35809 (DA0G2151)

To determine the potential accuracy of a multiple rocket system optimally designed for wind bias elimination by aim adjustment.

High aerodynamic stability is utilized, along with spin and mallaunch reduction techniques, to provide tight control about wind-biased boost trajectory. The actual bias will be measured during the first and subsequent rounds of the ripple and continuously corrected by a dynamically aimed launcher controlled from the instrument used to observed the bias.

SUPPORTED BY U.S. Dept. of Defense, Missile Research & Development Command, Systems Simulation & Development Directorate

4.0002, SUBMISSILE AEROBALLISTICS

C.E. Brazzel, U.S. Dept. of Defense, Army, Missile Research & Development Command, Systems Simulation & Development Directorate, *Redstone Arsenal, Huntsville, Alabama* 35809 (DA0G1003)

This work is designed to meet the need for improved responsiveness and lethality against point and area targets. Successful applications of terminally guided submissiles require solution of aeroballistic problems associated with satisfactory deployment, dispersal, and compact airframe configurations with adequate stability, control, and maneuverability.

Exploratory analysis will be made of various aeroballistic problems associated with submissile dispersal. Critical problems include mutual interference between submissiles, between submissile and carrier vehicle, and between carrier vehicle and protective shrouds. An available deployment computer model will be studied. An experimental program will assess the various methods of testing submissile deployment and interference phenomena. Various testing techniques will be analyzed to determine which is the most effective for the phenomena investigated. These include sled tests, wind tunnel tests, and flight tests.

SUPPORTED BY U.S. Dept. of Defense, Missile Research & Development Command, Systems Simulation & Development Directorate

4.0003, MAGNETIC BUBBLE DOMAIN WALL DYNAMICS

F.B. Humphrey, California Inst. of Technology, School of Engineering, Dept. of Electrical Engineering, *1201 E. California Blvd., Pasadena, California* 91109 (DMR77-24024)

The dynamics of magnetic bubble domains and domain walls will be investigated using a fast optical sampling microscope. With this microscope and sampling system, a single 10-nsec exposure photograph of the transient bubble or stripe domain configuration is taken time-sequenced sampled during a single reversal. The investigation will concentrate on single crystal materials of mixed rare earth garnets of the type useful for bubble devices. These samples are made by liquid phase epitaxial growth on a Gd3Ga5O12 substrate. Most of the investigations will involve samples of Y1.57 EuO.30TmO,30CaO.88GeO.88Fe4.12O12, Y1.57EuO.78TmO.65Ga1.05 Fe3.95O12 and (Y La)3 (FeGa)5 O12 although other compositions are available.

Free bubble translational motions will be made on various samples, especially implanted and high-threshold ones. Automation studies and in-plane fields will be included. Free bubble collapse and stripe chop will be investigated with particular emphasis on understanding the mechanism of the process and the characteristics of the head-on wall. Domain wall saturation velocity will be studied with emphasis on the role of in-plane fields. The high-drive wide dynamic diffuse boundary will be studied, especially in implanted material. Theoretical studies will be made emphasizing wall structures with vertical Bloch lines and capping structures. High 'g' garnet material will be investigated as well as amorphous GdCoMo. Device dynamics will be included, expanding from gap-tolerant propagation structures to logic structures such as transfer in and replicate/transfer. This is a renewal of NSF Grant DMR75-00420 A02, the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

4.0004, DEVELOPMENT OF THE ADVANCED FREE TIP HELICOPTER ROTOR CONCEPT

A.G. Liniecki, California State University & Colleges, San Jose State University, School of Engineering, Dept. of Mechanical Engineering, *Washington Sq., San Jose, California* 95192 (NCA 2-675101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

4.0005, A STUDY OF THE FIRE CHARACTERISTICS RESULTING FROM LIQUID FUEL SPILLS ON FLAT, INCLINED SURFACES

F. Holmstrom, California State University & Colleges, San Jose State University, School of Science, Dept. of Physics, *Washington Sq., San Jose, California* 95192 (NCC 2-114)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

4.0006, MOBILITY AID FOR THE BLIND
D.C. Harrison, Stanford University, School of Medicine, Dept. of Medicine, *300 Pasteur Dr., Stanford, California* 94305 (NCC 2-113)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

4.0007, MEASUREMENT OF THE TRANSITION TIMES OF NON-HYSTERIC SQUIDS CONSTRUCTED OF S-N-S BRIDGES
E.C. Jelks, U.S. Dept. of Defense, Navy, Naval Ocean Systems Center, Environmental Sciences Dept., *San Diego, California* 92152 (DN988706)

To measure the time required for a non-hysteric SQUID (superconducting quantum interference device) to change from the zero-voltage state to the voltage state.

The SQUIDs will be constructed of submicron-sized Josephson S-N-S bridges fabricated with a 'shadowing' technique developed at NOSC. This technique is used to form both the bridge and the submicron gap between the superconducting electrodes, resulting in a typical bridge size of about 0.5 micrometer (wide) x 0.2 micrometer (long) x 0.05 micrometer (thick). The switching action will be initiated by a fast-rising (30 ps) current pulse injected into a superconducting control line overlying the SQUID, and the transition time of the SQUID will be measured with the aid of a Dicke-type receiver to eliminate d.c. drift.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0008, RESEARCH AND DEVELOPMENT OF NEAT ALCOHOL FUEL USAGE IN AUTOMOBILES
R.K. Pefley, University of Santa Clara, School of Engineering, Dept. of Mechanical Engineering, *Santa Clara, California* 95053 (NAG 3-143)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

4.0009, UNSTEADY VORTEX ENTRAPMENT ON AN AIRFOIL
J.P. Retelle, U.S. Dept. of Defense, Air Force, Frank J. Seiler Research Lab., *Air Force Academy, Colorado Springs, Colorado* 80840 (DF282300)

AF function - technology base, counter air, close air support. Deficiency - flight vehicles currently designed in accordance with steady flow aerodynamic characteristics do not utilize potential performance capabilities available from dynamic stall and similar unsteady separation effects. How research contributes - this effort evaluates the formation, persistence and overall influence of energetic vortices produced by unsteady airfoil motions. The work ties to and is an extension of current research by FJSRL investigators in unsteady separation. Objectives - the research seeks to determine the feasibility of trapping a vortex generator by unsteady motions near the surface of an airfoil. An assessment of the correlation of airfoil motion, vortex intensity motion and stability, and the resultant surface loading will subsequently be made. Additionally, an analytical model will be developed to describe the results. This will lead to an improved understanding of the role of the various physical mechanisms on the flow field and suggest possible improvements in flight vehicle design and maneuvering techniques.

An NACA 0012 airfoil immersed in a subsonic wind tunnel flow will be oscillated in two degrees of freedom using a microcomputer drive providing for both pitching motion and axial translation. Transient and oscillatory motions will be analyzed. Flow field parameters will be measured using a multicomponent laser Doppler velocimeter and surface pressure transducers together with a minicomputer data acquisition system. A collateral analytical effort will be directed at generating a model describing the flow field.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Frank J. Seiler Research Lab.

4.0010, LEADING EDGE AERODYNAMIC RESPONSE OF AN OSCILLATING SUBSONIC CASCADE
F.O. Carta, United Technologies Corp., United Technologies Research Center, *400 Main St., East Hartford, Connecticut* 06108 (DN975707; N00014-79-C-0772)

The objective of this study is to develop enlightened understanding of dynamic stall on a cascade of oscillating airfoils and to determine how parameter variations and flow passage oscillations influence the leading edge region response. Such information will be useful in understanding blade flutter problems as an adjunct to attaining maximum engine thrust-to-weight ratios in the framework of conservative and safe designs for improved naval weaponry applications.

Analysis will be made of recently obtained test data to link blade leading edge region aerodynamic response to variations in system geometry. The sensitivity of the leading edge region suction surface load response to variations in mean incidence angle, frequency, interblade phase angle, and gap-to-chord ratio will be evaluated. Free-stream disturbances measured on the tunnel sidewall along the inlet plane will be studied to determine their correspondence with the response of the blade leading edge region.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0011, ELEVATED TEMPERATURE BIAXIAL FATIGUE
E.H. Jordan, University of Connecticut, Storrs Campus, Graduate School, *Storrs, Connecticut* 06268 (NAG 3-160)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

4.0012, GRADUATE ASSISTANT PROGRAM IN SCIENCE AND ENGINEERING
T.L. Gill, Howard University, Graduate School of Arts & Sciences, Dept. of Mathematics, *2400 6th St. N.W., Washington, District of Columbia* 20001 (NGT 09-011-080)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

4.0013, OPTIMAL ATTITUDE CONTROL OF FLEXIBLE SATELLITES
K.T. Alfriend, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN680434)

The objective of this program is the development of methods for the optical and sub-optical attitude control of large flexible satellites.

Primary emphasis in this program is being placed on optimal large angle maneuvers of two flexible satellites. This is a nonlinear optimization problem since the equations of motion for the rotational motor of a rigid body are nonlinear. To develop potential techniques for the solution of the general problem and to determine the effects of modeling errors (model truncation, parameter errors, etc.) the problem of an optimum maneuver about a principal axis is being studied. Techniques developed for this problem will then be tested on the arbitrary maneuver problem.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

4.0014, SINGLE-MODE OPTICAL TECHNOLOGY
T.G. Giallorenzi, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN780046)

Develop integrated optics and single-mode fiber optics for use in military systems. (a) Coordinate research and development activities of in-house and contracted efforts. (b) Evaluate devices resulting from contracted work. (c) Assemble microoptic integrated circuits and systems using contractor- and in-house-developed devices. (d) In-house-develop microoptic switches and single-mode couplers for use in fiber optic communications systems. (e) Develop microoptic signal processors such as i.o. spectrum analyzers for radar warning receivers and high

speed a/d converters. (f) Develop couplers for multimode fiber optic data bus systems and couplers for multimode systems.

NRL, through in-house and contracted research, will develop single-mode fiber optics and integrated optics technology. NRL will develop polarization independent microoptic switches/modulators, single-mode fiber-to-channel waveguide connectors, fiber-to-fiber splicers and assemble microoptic circuits for use in communications and signal processing. Contracted work will be directed toward the development of a second fiber-to-film coupler, and fiber-to-injection laser coupling, microoptical lens and high-speed photodiode array development.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

4.0015, AIRCRAFT/STORE INTERFACE TECHNOLOGY

F.L. Benedick, U.S. Dept. of Defense, Air Force, Armament Lab., *Eglin Air Force Base, Florida* 32542 (DF646990)

Air Force function - standard aircraft/STORE electrical interfaces. Deficiency - currently, there is little aircraft/STORE electrical interoperability. Electrical interfaces are designed on a case-by-case basis with little resulting standardization. Objective - generate the technology required to apply new multiplexing techniques to future aircraft/STORE interfaces. How work contributes - the results of this effort will contribute to the design of a standard aircraft/STORE interface. This interface, when implemented, can remove one of the major obstacles to interoperability between aircraft and STOREs.

Problems inherent in a multiplexed interface will be studied and solutions proposed. Promising interfacing concepts will be investigated by developing hardware and software in-house for simulations and applications analyses. Fiber optics, microprocesser, VLSI and NEXTED bus concepts will be implemented and tested.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Armament Lab.

4.0016, MOTION DRIVE SIGNALS FOR FLIGHT SIMULATORS

W.T. Harris, U.S. Dept. of Defense, Navy, Naval Training Equipment Center, Advanced Simulation Concepts Lab., *Orlando, Florida* 32813 (DN794017)

Develop several methods for calculating motion drive signals in flight simulators and relate them to motion system characteristics, flight maneuvers and training effectiveness.

Select several methods from those found in use or in the literature. Perform a preliminary selection of algorithms to be evaluated for training effectiveness by two selection experiments - the first based on system performance measures (an in-simulator study), the second a comparison of pilot control activity (in simulator to aircraft). Then evaluate the pre-selected algorithms using transfer of training methods.

SUPPORTED BY U.S. Dept. of Defense, Naval Training Equipment Center, Computer Systems Lab.

4.0017, MULTI-DIMENSIONAL RADIATIVE TRANSFER AND AEROSOL PROPERTIES IN SUPPORT OF CLIMATE STUDIES

A.C. Cogley, University of Illinois, Chicago Circle Campus, School of Engineering, Dept. of Energy Engineering, *Box 4348, Chicago, Illinois* 60680 (NCA 2-330101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

4.0018, LUBRICATING EFFECTIVENESS OF SOLID LUBRICANT ADDITIVES IN MINERAL OILS

C. Cusano, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Mechanical & Industrial Engineering, *106 Engineering Hall, Urbana, Illinois* 61801 (NAG 3-153)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

4.0019, USE OF A LASER DOPPLER VELOCIMETER IN FLAMMABILITY TUBE

R.A. Strehlow, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Electrical Engineering, *106 Engineering Hall, Urbana, Illinois* 61801 (NAS 3-22666)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

4.0020, INVESTIGATION OF THE THERMOPHYSICAL PROPERTIES OF PBSNTE AND HGCDTE

R.E. Taylor, Purdue University, School of Electrical Engineering, *Executive Bldg., West Lafayette, Indiana* 47907 (NAS 8-34303)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

4.0021, CREATION OF AN EXPERIMENTAL TECH-TRANSFER PROJECT AT THE UNIVERSITY OF KANSAS CENTER FOR RESEARCH, INC.

B.G. Barr, University of Kansas, Lawrence Campus, School of Engineering, Dept. of Mechanical Engineering, *Learned Hall, Lawrence, Kansas* 66044 (NASW 3438)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space & Terrestrial Applications

4.0022, DYE LASER TRAVELING WAVE AMPLIFIER RESEARCH

F.M. Davidson, Johns Hopkins University, School of Engineering, Dept. of Electrical Engineering, *34th & Charles Sts., Baltimore, Maryland* 21218 (NCC 5-24)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

4.0023, SUMMER FACULTY FELLOWSHIP PROGRAM

R.T. Yeh, University of Maryland, College Park Campus, School of Arts & Sciences, Dept. of Computer Science, *College Park, Maryland* 20742 (NGT 21-002-805)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

4.0024, AN INVESTIGATION OF OPTICAL COMMUNICATION SYSTEMS FOR IMPROVED LOW-VISIBILITY COMMUNICATION

R.S. Kennedy, Massachusetts Inst. of Technology, Research Lab. of Electronics, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (ENG78-21603)

A comprehensive study of optical systems for use in short-haul, terrestrial, line-of-sight atmospheric communications which experience occasional outages due to local adverse weather conditions is being conducted. The long-term goals of this research program are to: (1) establish an analytical basis for predicting the attainable communication performance that can be realized at operating ranges of 1 to 10 kilometers as a function of gross atmospheric parameters, (2) determine the system design and device characteristics that realize the attainable performance, (3) create devices that are critical to the performance realization, and (4) establish the validity and utility of the results experimentally in a representative situation.

The specific tasks that are being undertaken in accomplishing these basic goals include system considerations, propagation, adaptive phase compensation, and the transmitting source (holmium 2-micrometer laser). Subsequent tasks involve avalanche detectors for use at a wavelength of 2 micrometers and wide-angle, narrow-band optical filters.

SUPPORTED BY U.S. National Science Foundation, Directorate for Engineering

4.0025, HIGH DATA RATE (MULTIGIGABIT) SATELLITE COMMUNICATION SYSTEM STUDY
M. Siegel, Michigan State University, School of Engineering, Dept. of Electrical Engineering & Systems Science, *Engineering Bldg., East Lansing, Michigan* 48824 (NAS 5-26445)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

4.0026, III-V COMPOUND SEMICONDUCTORS FOR MICROWAVE APPLICATION
J.A. Woollam, University of Nebraska, Lincoln Campus, School of Engineering & Technology, Dept. of Electrical Engineering, *Lincoln, Nebraska* 68508 (NAS 3-22465)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

4.0027, APPLICATION OF FDM TO FIBER OPTIC DATA BUSSING IN REAL-TIME REDUNDANT, DISTRIBUTED COMPUTING SYSTEMS
H. Zanger, City University of New York, City College, School of Engineering, Dept. of Electrical Engineering, *Convent Ave. & 138th St., New York, New York* 10031 (NCC 2-108)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

4.0028, CHAIRMANSHIP OF THE SCIENCE AND ENGINEERING ADVISORY BOARD FOR THE SOLIDIFICATION EXPERIMENT SYSTEM PROJECT
W.R. Wilcox, Clarkson College of Technology, School of Engineering, Dept. of Chemical Engineering, *51 Main St., Potsdam, New York* 13676 (NAS 8-34308)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

4.0029, AERODYNAMIC PROBLEMS OF LARGE-SCALE COOLING DEVICES
F.K. Moore, Cornell University, Ithaca Campus, School of Engineering, Dept. of Mechanical & Aerospace Engineering, *242 Carpenter Hall, Ithaca, New York* 14853 (ENG76-02516 A02)

This basic study on dry cooling systems will be in part concerned with the viscous flow in an infinite stack of zig-zag plates intended to represent a yawed heat-exchanger array. In particular, various corner configurations will be investigated and heat transfer rates in corner regions will be predicted. A different but related approach to the yawed heat exchanger problem will emphasize the limit of high drag. Classes of devices intended to accomplish reversible turning at 'bundle' entrance, and irrotational flow at bundle exit will be studied. A general concept for best arrangement of heat exchanger bundles in a cooling-tower entrance will be developed, based on smooth bell-mouth entrance flow, and studies of wind-generated swirls in tower entrance flows, already begun, will be completed. More elaborate studies on exit flow will be undertaken in a wind tunnel and a water tank with a travelling jet. Also considered will be innovative flow devices, such as external ring airfoils, for the control of aerodynamic nonuniformities. This will be a continuation of NSF Grant No. ENG 76-02516.

SUPPORTED BY U.S. National Science Foundation, Directorate for Engineering

4.0030, GROUND AND TROPOSPHERE LOW FREQUENCY EFFECTS
J.L. Heckscher, U.S. Dept. of Defense, Air Force, Rome Air Development Center, *Griffiss Air Force Base, Rome, New York* 13441 (DF904160)

Development of an in-house theoretical and experimental capability to predict and measure low frequency radio propagation over irregular, inhomogeneous terrain. Development of techniques to determine earth characteristics which influence the ground wave. Improvement of methods of incorporating physiographic data into the equations of ground wave propagation. Study effects of troposphere inhomogeneities on ground wave stability. Improve and extend VLF/ELF systems by identifying and measuring electrical noise caused by motion of aerosphace vehicles through the troposphere. Refine new techniques for advanced detection of dangerous charge build-up in clouds, to improve lightning warning and to provide the basis for lightning damage avoidance systems.

The in-house theoretical capability will be accomplished beginning with existing 'residue series' ground wave propagation equations for the smooth round earth formulated by Van Pol and Bremmer and used by Wait and Johler and continuing with the integral equation approach developed by Hufford and others. The equations will be cast into forms suitable for high speed digital computation and numerical predictions for specific paths will be compared. The experimental capability will be realized with construction of equipment to transmit LF pulses having only one or two radio frequency cycles. In conjunction with existing digital receiving techniques, this short pulse device will constitute a precision tool for the measurement of LF propagation. Soil characteristics represent one of the least well-known of the various factors required for accurate ground wave prediction. Inversion of the integral equation results in a solution for the surface impedance in terms of the attentuation function and the path topology. A hybrid method, to account for terrain irregularities by a perturbation of the smooth round earth solution, may result in a significant reduction in computation time. Stability will be studied by observing time-of-arrival of Loran pulses, using ultra-stable cesium standards as the local reference. Improved VLF/ELF reception on aircraft will be sought by studying techniques which can either reduce the sensitivity of the receiving system to the noise, or which can act directly to diminish the intensity of the noise itself. A new prototype electrograph will be built and installed at CCAFS, so that a comparision study with a radar display can be made during the active thunderstorm season.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0031, EXPERIMENTAL STUDIES OF FLIGHT PERFORMANCE
W. Nykvist, U.S. Dept. of Defense, Army, Army Materiel Development & Readiness Command, Army Research Office, *P.O. Box 12211, Research Triangle Park, North Carolina* 27709 (DA0H4257)

To obtain in-flight aerodynamic performance data to confirm/refine key parameters used in six-degree-of-freedom (6-DOF) computer simulation. To procure and test selected guidance and control systems used to guide a cargo-carrying gliding parachute to a specific landing area.

Design and fabricate a gliding parachute flight data recording system using existing ASN-95 transmitter and receiver. Continuously record up to 14 variables while gliding the parachute through specific maneuvers. Use data to adjust and refine assuptions used in 6-DOF computer program. Use testing experience and computer simulation to choose a specific guidance and control system for procurement and test prior to engineering development.

SUPPORTED BY U.S. Dept. of Defense, Army, Natick Research & Development Command

4.0032, DEVELOPING A TECHNIQUE FOR TRANSLATING THE ELECTRON DIFFRACTION IMAGE OF A PHOSPHOR SCREEN TO COMPUTER LANGUAGE
J.A. Mann, Case Western Reserve University, School of Engineering, Dept. of Chemical Engineering, *University Cir., Cleveland, Ohio* 44106 (NAS 3-22549)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

4.0033, EXPANSION OF PRESTO COMPUTER CODE FOR OFF-DESIGN PERFORMANCE CALCULATION OF STEAM TURBINE GENERATORS
R.S. Gorla, Cleveland State University, Fenn College of Engineering, Dept. of Mechanical Engineering, *1983 E. 24th, Cleveland, Ohio* 44115 (NAG 3-155)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

4.0034, INTERFERENCE BETWEEN ANALOG AND DIGITAL METHODS OF MODULATION OF TELEVISION SIGNALS

P.P. Groumpos, Cleveland State University, Fenn College of Engineering, Dept. of Electrical Engineering, *1983 E. 24th, Cleveland, Ohio* 44115 (NAG 3-156)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

4.0035, ENGINEERING CALCULATIONS FOR COMMUNICATIONS SATELLITE SYSTEMS PLANNING

C.A. Levis, Ohio State University, Columbus Campus, School of Engineering, Dept. of Eelectrical Engineering, *190 N. Oval Dr., Columbus, Ohio* 43210 (NAG 3-159)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

4.0036, PLASMA EXCITATION AND DIAGNOSTICS

D. Toodle, U.S. Dept. of Defense, Air Force, Aero Propulsion Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF464660)

To develop methods of measuring ionic and neutral species densities in plasmas and to study new methods of producing high energy density plasmas.

A quadrupole mass spectrometer will be used to monitor relative and absolute concentration of various atoms and molecules produced in rare-gas halide lasers. High power pulsed microwave energy will be used to excite discharges in gases and vaporized solids.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

4.0037, INTERFERENCE SUSCEPTIBILITY OF DIGITAL TELEVISION SYSTEMS

S.C. Kwatra, University of Toledo, School of Engineering, Dept. of Electrical Engineering, *2801 W. Bancroft St., Toledo, Ohio* 43606 (NAG 3-157)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production and Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, BURST AND TRANSIENT SOURCE EXPERIMENT (BATSE) FOR THE GAMMA-RAY OBSERVATORY

R.R. Wilson, University of Alabama in Huntsville, Graduate School, *Huntsville, Alabama* 35807 (NAS 8-34137)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

5.0002, DISTRIBUTION OF LAVA FLOWS IN THE THARSIS REGION OF MARS

D.H. Scott, U.S. Dept. of the Interior, Geological Survey, Geologic Div., Branch of Astrogeological Studies, *2255 N. Gemini Dr., Flagstaff, Arizona* 86001 (0-9580-02358)

Geologic mapping of lava flows in the Tharsis region will be continued in parts of the Diacria, Arcadia, Amazonis, Tharsis, Phoenicis Lacus, Phaethontis, and Thaumasia quadrangles of Mars. Lava flow chronology is being used to determine the sequnce of tectonic events in this province. Lava flow maps will be published at 1:2 million scale by the U.S. Geological Survey as a series of I-maps.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0003, GEOMAGNETIC SECULAR VARIATION AND VOLCANIC TIMING AND EPISODE CORRELATION

S. Gromme, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *345 Middlefield Rd., Menlo Park, California* 94025 (9790-02075)

STATES TO WHICH PROJECT PERTAINS: All states west of Colorado, including Hawaii.

During FY 80, the project will continue to have objectives on many fronts. Review of Champion's thesis is well in hand after a much delayed review of the initial draft. Final review and oral defense of the thesis should be completed near the 1st of the calendar year. Final summary work will be performed on the geologic and paleomagnetic analysis of the Craters of the Moon Lava Field and the Great Rift Wilderness, with the possibility of minor additional collecting of samples. Work on the collection and polarity evaluation of several intermediate depth cores (2000 to 3000 ft.) from the Snake River Plain will also begin. Paleoinclination work on shallow cores from the RWMC of the Idaho National Engineering Laboratory will be completed to evaluate the volcanic hazard to that site. Work will be continued on the reconstruction of the history of Holocene secular variation in Hawaii and it's use for dating and correlation purposes. In addition, a start on paleointensity determinations is contemplated for these dated volcanic rocks.

Some work may be begun this fiscal year on the volcanic history of the Medicine Lake and Crater Lake volcanoes using paleomagnetism in support of geothermal investigations.

Some work on very different rocks from those mentioned above will be continued and completed on the directions of magnetization of Cretaceous aged turbidites at Pigeon Pt., CA. Preliminary indications are that these rocks were magnetized along the west coast of Mexico and have been transported approximately 2700 km northward.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0004, EQUATORIAL EXTREME FAR ULTRAVIOLET AIRGLOW

C.S. Bowyer, University of California, Berkeley Campus, School of Letters & Science, Dept. of Astronomy, *Berkeley, California* 94720 (NAG 5-139)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0005, ATMOSPHERIC PLANETARY WAVE RESPONSE TO EXTREME FORCING

D.E. Stevens, Colorado State University, School of Science, Dept. of Atmospheric Science, *Fort Collins, Colorado* 80523 (NAG 5-136)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0006, ELECTROMAGNETIC PROSPECTING METHODS APPLIED TO URANIUM EXPLORATION

B.D. Smith, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *Box 25046, Denver Fed. Ctr. Bldg. 25, Denver, Colorado* 80225 (9780-01760)

STATES TO WHICH PROJECT PERTAINS: Western United States and the Great Lakes Region.

Three new project areas will be started next year in the San Juan Basin (Arizona), San Juan Mts. (Colorado), and the Upper Peninsula (UP) of Michigan. The Arizona project will make use of high precision airborne magnetic and ground magnetic, and induced polarization surveys to locate halo's of deep-seated uranium mineralization. In the San Juan Mt. area non-radiometric ground and airborne surveys will be used to help refine genetical models for caldera uranium mineralization. Airborne electromagnetic, magnetic and radiometric geophysical surveys will be used in the Upper Peninsula of Michigan to aid in definition geologically favorable areas for uranium mineralization.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0007, REMOTE SENSING GEOTHERMAL
K. Watson, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *Box 25046, Denver Fed. Ctr. Bldg. 25, Denver, Colorado* 80225 (9790-00922)

STATES TO WHICH PROJECT PERTAINS: Washington, Oregon, California, Hawaii.

Extend the use of a theoretical thermal model to more complex geological situations, including topographic and surface-roughness effects. Develop computer methodology for registration of aircraft images acquired at different times in the diurnal cycle and apply these techniques to the analysis of multispectral data acquired on the island of Hawaii.

Digitize linear features mapped from computer-enhanced LANDSAT images of the Cascade Range from central Washington to northern California and statistically analyze for preferred orientation and length characteristics. Apply computer graphics techniques to the linear feature data to attempt to define regional tectonic patterns. Prepare an uncontrolled LANDSAT mosaic of the region from computer-enhanced images.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0008, COLLABORATIVE STUDY OF HIGH RESOLUTION INFRARED ATMOSPHERIC SPECTRA
A. Goldman, University of Denver, School of Arts & Sciences, Dept. of Physics, *2115 S. University Blvd., Denver, Colorado* 80210 (NCC 1-48)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

5.0009, MILITARY EFFECTS OF SOLAR ACTIVITY
R.W. Kreplin, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN920016)

To study the structure of the solar atmosphere and the phenomena occurring therein. To describe the mechanisms by which the terrestrial environment is affected by high energy solar emissions. Especially to develop techniques to predict and evaluate disturbances in navigation and surveillance.

Solar plasmas are studied to determine the physical mechanisms of solar activity. Observations are made with X-ray and EUV spectrometers, photometers and X-ray imaging devices. The spectra of laboratory plasmas such as laser-produced and Tokamak plasmas are also investigated to aid in the understanding of solar plasmas.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

5.0010, DELTA-K RADAR DEVELOPMENT PROGRAM
D.L. Schuler, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN480224)

The purpose of this research project is to determine the effectiveness of a coherent dual-frequency correlation radar for achieving (a) target classification, and (b) remote sensing of ocean waves and surface currents.

The Delta-K radar transmits two closely spaced RF frequencies and, upon reception, cross-correlates the coherently detected backscattered em fields to achieve an output which has many of the characteristics of HF return from ships and the sea. Target classification is implemented through swept-frequency measurement of target resonances which occur at the difference frequency. Sea spectra and ocean surface currents are remotely sensed by this system.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

5.0011, RELATIONSHIP BETWEEN LINEAMENTS AND GROUNDWATER FLOW IN THE SOUTHWEST GEORGIA AQUIFER
G.A. Brook, University of Georgia, Franklin College of Arts & Sciences, Dept. of Geography, *Athens, Georgia* 30601 (A-086-GA)

The objectives of the proposed research are to determine how lineaments relate to groundwater flow in southwest Georgia, and to develop a model relating well capacity to lineament proximity and size. Such a model will be a powerful tool in groundwater resource management.

The first step in the research will be to develop an accurate and efficient method of mapping lineaments in southwest Georgia. Two approaches will be tested in a small 18-by-18 mile area - the western half of Dougherty County. The first will involve direct mapping of lineaments on SKYLAB, LANDSAT, and high altitude black-and-white imagery; the second will involve analysis of the distribution and shapes of sink holes mapped from remotely sensed imagery.

When the most efficient method of lineament mapping has been determined, a lineament map of a four-county area will be prepared and statistically analyzed. Using well data available from Federal and State agencies, a model relating well capacity and lineament proximity and length will be developed. Results will indicate well capacities to be expected at various distances from lineaments, and the effect of lineaments on the groundwater flow pattern.

SUPPORTED BY U.S. Dept. of the Interior, Office of Water Research & Technology

5.0012, TROPICAL CYCLONE TRACK AND GENESIS FORECASTING
S.Q. Kidder, University of Illinois, Urbana Champaign Campus, School of Liberal Arts & Sciences, Dept. of Atmospheric Sciences, *Urbana, Illinois* 61801 (NAG 5-132)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0013, USE OF MAGSAT ANOMALY DATA FOR CRUSTAL STRUCTURE AND MINERAL RESOURCES IN THE U.S. MIDCONTINENT
R.S. Carmichael, University of Iowa, School of Liberal Arts, Dept. of Geology, *Jessup Hall, Iowa City, Iowa* 52240 (NAS 5-26425)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0014, AIRBORNE LASER HYDROGRAPHY DEVELOPMENT
D. Enabnit, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Ocean Survey, Engineering Development Lab., Sensor Development Branch, *6001 Executive Blvd., Rockville, Maryland* 20852 (CE1000/86221700)

OBJECTIVE: Design, develop and conduct developmental tests on an airborne laser hydrography system.

APPROACH: An analysis of candidate positioning systems will be conducted to determine the trade-off between accuracy and costs.

Technical assistance will be provided to the Navy's laser development program as a basis for assuring laser system compatibility with our (NOS) requirements.

Specifications for the hydrographic software development will be written. Specialized technical problems will be addressed and solutions refined through continued computer modeling.

PROGRESS: The cost-effectiveness of the system is five times that of existing shallow water data acquisition systems. NOS plans to procure an airborne laser system and included procurement costs in the FY82 budget.

Documentation of the analytical work conducted to date continues. Technical assistance to the Navy in support of their airborne laser procurement will also continue since this support work is directly applicable to the NOS procurement.

SUPPORTED BY U.S. Dept. of Commerce, National Ocean Survey, Engineering Development Lab.

5.0015, PROVIDE SCIENTIFIC PERSONNEL FOR PARTICIPATION IN THE COOPERATIVE VISITOR PROGRAM

F. Baer, University of Maryland, College Park Campus, School of Arts & Sciences, Dept. of Meteorology, *College Park, Maryland* 20742 (NAS 5-26463)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0016, RESEARCH RELATIVE TO SEVERE CONVECTIVE STORM DIAGNOSTICS

R.L. Pitter, University of Maryland, College Park Campus, School of Arts & Sciences, Dept. of Meteorology, *College Park, Maryland* 20742 (NAG 5-133)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0017, SECOND-ORDER BUDYKO-TYPE PARAMETERIZATION OF LAND SURFACES HYDROLOGY

P.S. Eagleson, Massachusetts Inst. of Technology, School of Engineering, Dept. of Civil Engineering, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (NAG 5-134)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0018, MECHANISMS OF INTERANNUAL OCEAN-ATMOSPHERE INTERACTIONS

C.J. Frankignoul, Massachusetts Inst. of Technology, School of Science, Dept. of Meteorology & Physical Oceanography, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (NAG 5-137)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0019, SCIENTIFIC INVESTIGATION OF THE MINERALOGY OF MAGNETIC ANOMALIES

S.E. Haggerty, University of Massachusetts, Amherst Campus, School of Arts & Sciences, Dept. of Geology & Geography, *Amherst, Massachusetts* 01002 (NAS 5-26414)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0020, NAVY ENVIRONMENT - OCEANOGRAPHIC/METEOROLOGICAL DATA SYSTEM

K.R. Peal, Woods Hole Oceanographic Institution, *Main St., Woods Hole, Massachusetts* 02543 (DN075098; N00014-79-C-0071)

Design and assemble an oceanographic/meteorological data sensor and communication system for research ship applications.

An integrated data sensor system will be developed for research ship application. Sensors will include air temperature and dewpoint, sea surface temperature and conductivity, wind speed and direction, ship speed and heading, and integrated solar radiation. The system will conform to the proposed SAIL standard for shipboard data communications.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0021, PROCESSES OF PRODUCTION AND LOSS IN THE AURORAL ZONE AND MIDLATITUDES

W.E. Sharp, University of Michigan, Ann Arbor Campus, School of Engineering, Dept. of Atmospheric & Oceanic Science, *Ann Arbor, Michigan* 48104 (NAG 5-140)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0022, LARGE-SCALE IDENTIFICATION OF IRRIGATED LANDS APPLICATION SYSTEMS VERIFICATION AND TRANSFER (ASVT) PROJECT

D.C. Rundquist, University of Nebraska, Omaha Campus, School of Liberal Arts & Sciences, Dept. of Geography & Geology, *Box 688, Omaha, Nebraska* 68101 (NAS13-168)

SUPPORTED BY U.S. National Aeronautics & Space Admin., National Space Technology Lab.

5.0023, AN INVESTIGATION OF THE EFFECTS OF HOT ATOM CHEMISTRY OF MINOR CONSTITUENTS IN THE ATMOSPHERE OF JUPITER AND SATURN

T.C. Owen, State University of New York, Stony Brook Campus, School of Arts & Sciences, Dept. of Earth & Space Sciences, *Stony Brook, New York* 11790 (NCA 2-760101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

5.0024, NON-NUCLEAR POLLUTANTS IN STRATOSPHERIC AIR

E.P. Hardy, U.S. Dept. of Energy, Office of Health & Environmental Research, Environmental Measurements Lab., *376 Hudson St., New York, New York* 10014 (106679 TICNO; 001783)

The objectives are to document the concentrations of selected stable tracers (particulate and gases) in the stratosphere as a function of latitude, altitude and season; to inventory the stratospheric burdens of these materials; to examine vertical transport in the troposphere; to develop and test stratospheric transport models; and to supply basic data for other scientific programs in studying the ultimate deposition of tracers in the environment. Particulate and gas sampling is conducted by both aircraft (Project Airstream) and balloons (Project Ashcan) in the stratosphere on a seasonally repetitive basis in the northern hemisphere. Aircraft sampling extends from 75 degrees N to the equator at four altitudes up to 63K ft. and balloons are launched in Alaska, Panama and New Mexico to 70, 80, and 90K ft. Data and interpretive analysis are routinely published and distributed to all member nations through the United Nations.

SUPPORTED BY U.S. Dept. of Energy, Office of Health & Environmental Research

5.0025, STUDY OF CONVECTION IN A SOLIDIFYING BINARY MIXTURE AT REDUCED GRAVITY

B.N. Antar, University of Tennessee, Knoxville Campus, School of Engineering, Dept. of Engineering Science & Mechanics, *W. Cumberland Ave. S.W., Knoxville, Tennessee* 37916 (NAS 8-34268)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

5.0026, MEASUREMENT OF TRACE LEVELS OF CHLORINE IN THE STRATOSPHERE

D.C. Warren, Houston Baptist University, School of Science & Health Professions, Dept. of Chemistry, *7502 Fondren Rd., Houston, Texas* 77036 (NAG 9-13)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lyndon B. Johnson Space Center

5.0027, SATELLITE GROUND-BASED SPECIAL MESOSCALE NETWORK AND DATA PROCESSING

J.R. Scoggins, Texas A & M University, College Station Campus, School of Geosciences, Dept. of Meteorology, *College Station, Texas* 77843 (NAS 8-34133)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

5.0028, RESEARCH RELATIVE TO PLASMA SHEET PROCESSES ASSOCIATED WITH DISCRETE AURORAL ARCS

W.J. Heikkila, University of Texas, Dallas Campus, School of Natural Science & Mathematics, Dept. of Physics, *P.O. Box 688, Richardson, Texas* 75080 (NAG 5-138)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0029, STRUCTURAL STUDIES OF THE ALLEGHENY PLATEAU USING REMOTE SENSING TECHNIQUES

H.A. Pohn, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *12201 Sunrise Valley Dr., Reston, Virginia* 22092 (9790-02646)

STATE TO WHICH PROJECT PERTAINS: Pennsylvania.

Using LANDSAT RBV (Return-Beam Vidicon) and MSS (Multispectral Scanner) images and HCMM (Heat Capacity Mapping Mission) images, target areas (e.g., lineaments) will be selected for further field study. These target areas include unmapped or poorly understood structures on the Allegheny Plateau and the transition zone between the Allegheny Plateau and the Valley and Ridge Provinces.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0030, REMOTE SENSING OF DYNAMIC GEOLOGICAL PHENOMENA AND GEOLOGIC HAZARDS

R.S. Williams, U.S. Dept. of the Interior, Geological Survey, Land Information & Analysis Office, *12201 Sunrise Valley Dr., Mail Stop 710, Reston, Virginia* 22092 (7030-24006/7/8)

Project plans for FY 1980 include the following: (1) Preparation of an 'Illustrated Geomorphic Classification of Basaltic Landforms of Iceland,' as the first half of a 2-year, NASA-sponsored research project in support of NASA's comparative planetary geology research program. Two-to-three weeks of field work in Iceland will be directed at completing the acquisition of ground and aerial photographs of basaltic landforms. (2) Completion of the collecting and indexing of the estimated 5,000 extant publications on the geology of Iceland. By the end of FY 1979 approximately 4,000 publications had been catalogued and indexed. (3) Preparation of the USGS Professional Paper, 'Remote Sensing of High-Temperature Geothermal Areas of Iceland,' will be continued as a collaborative effort with 2 Icelandic co-editors and 13 other authors. One week of field and related work in Iceland, in conjunction with the NASA-sponsored study, will also be carried out. (4) The text for each of three USGS I-maps on the Vatnajokull ice cap, Iceland, will be completed and submitted for publication. The three I-maps are as follows: A, a conventional computer-enhanced, LANDSAT 1 MSS image; B, a nonconventional computer-enhanced LANDSAT 1 MSS image; and C, a LANDSAT 3 RBV orthoimage mosaic combined with supplementary information from LANDSAT 1 MSS images, GEOS radar altimetry data (surface contours), and radio-echosounding data (bedrock contours). (5) Analysis of SEASAT SAR images of Iceland will be conducted to determine their value for structural and tectonic studies, for glaciological phenomena studies, for differentiating different geologic formations, and for geomorphological research.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Land Information & Analysis Office

5.0031, INTERPLANETARY DUST EXPERIMENT

S.F. Singer, University of Virginia, School of Arts & Sciences, Dept. of Environmental Sciences, *Garrett Hall, Charlottesville, Virginia* 22903 (NAS 1-16550)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

5.0032, ANALYSIS OF EARTH RADIATION BUDGET/ EARTH RADIATION BUDGET EXPERIMENT SENSORS

J.R. Mahan, Virginia Polytechnic Inst. & State University, School of Engineering, Dept. of Mechanical Engineering, *Blacksburg, Virginia* 24061 (NAS 1-16508)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

5.0033, WISCONSIN . REMOTE SENSING APPLICATIONS PROJECT

F.L. Scarpace, University of Wisconsin, Madison Campus, Inst. for Environmental Studies, *Agriculture Hall, Madison, Wisconsin* 53706 (NAS 5-26423)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, A-10 TRAINING RESEARCH SUPPORT

S.T. Hannan, U.S. Dept. of Defense, Air Force, Human Resources Lab., *Williams Air Force Base, Chandler, Arizona* 85224 (DF223450)

To modify cockpit A of the advanced simulator for pilot training (ASPT) to an A-10 configuration to provide a tactial weapons delivery capability, heads-up display, A-10 flight and weapon scoring in support of transition training research and air-to-surface research capabilities.

The necessary hardware modifications will be performed on-site under the ASPT maintenance contracts. The flight dynamics for the A-10 will be developed under a joint in-house/ contractor effort. The A-10 project has been segmented into two phases. Phase I addresses the modifications required for transition training/research and should be completed in the first quarter of FY 78. Phase II will provide the capability for air-to-surface research and is scheduled to begin Jan 1, 1978. Efforts in phase II will refine the ASPT handling characteristics to approximate the A-10 performance as closely as possible. This phase will continue for 12-14 months.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0002, A PREVENTIVE METHOD FOR THE ZERO-GRAVITY SICKNESS SYNDROME

J. Kamiya, University of California, San Francisco Campus, Langley Porter Neuropsychiatric Inst., *401 Parnassus Ave., San Francisco, California* 94122 (NCC 2-115)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0003, ROLE OF INTERMOLECULAR INTERACTIONS IN THE SELF-ORGANIZATION OF POLYTRIPEPTIDE MODELS OF COLLAGEN

R. Bhatnagar, University of California, San Francisco Campus, School of Dentistry, Dept. of Periodontology, *551 Parnassus Ave., San Francisco, California* 94122 (NCA 2-665101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0004, COMPARISON OF THE EFFECTS OF INSULIN-LIKE GROWTH FACTOR, NEUROTROPHIC FACTOR, AND SOMATOTROPIN ON MUSCLE GROWTH

D.A. Riley, University of California, San Francisco Campus, School of Medicine, Dept. of Anatomy, *551 Parnassus Ave., San Francisco, California* 94122 (NCA 2-665102)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0005, HISTOPATHOLOGICAL EVALUATION OF ANIMALS IN RADIATION LIFESPAN STUDIES

E.V. Benton, University of San Francisco, School of Science, Dept. of Physics, *2130 Fulton, San Francisco, California* 94117 (NCA 2-670101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0006, MECHANISMS OF FLUID INTAKE

M.J. Fregly, State University System of Florida, University of Florida, School of Medicine, Dept. of Physiology, *1600 Archer Rd., Box J-266, Gainesville, Florida* 32610 (NCA 2-240101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0007, HUMAN FACTORS ENGINEERING IN SUPPORT OF ARMY AVIATION

C.A. Fry, U.S. Dept. of Defense, Army, Army Materiel Development & Readiness Command, Human Engineering Lab., *Aberdeen Proving Ground, Maryland 21005 (DA0C4955)*

To devise means of simplifying helicopter crew-station through effective control/display integration for enhancing mission performance in night flying operations. Establish human performance criteria for performing aircraft maintenance in the forward area under night conditions.

Design parameters will be established for optimizing the interaction of the aircrew with the helicopter through a process of analysis, mock-up simulation, and flight test. The major problems to be addressed are control/display arrangement in the cockpit, CRT integration, symbology parameters, navigational accuracy, communication simplification, target hand-off and aircraft control simplification. Maintenance tasks will be analyzed to ascertain potential for simplification and the value of tactile cues for night, forward area operations. A focal point of cockpit instrumentation will be established to insure sound integration of all equipment which interfaces with the crew.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Human Engineering Lab.

6.0008, DEVELOPMENT OF A MEDAS SYSTEM FOR MICROCOMPUTERS

E.W. Chapin, University of Maryland, Eastern Shore, Undergraduate School, Dept. of Mathematics & Computer Science, *Princess Anne, Maryland* 21853 (NAS 5-26464)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

6.0009, CELLULAR AND SUBCELLULAR CHARACTERISTICS OF BONE FOLLOWING SPACE FLIGHT

S.B. Doty, Columbia University, College of Physicians & Surgeons, Dept. of Orthopedic Surgery, *630 W. 168th St., New York, New York* 10032 (NCA 2-172101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0010, PLANT GROWTH IN CONTROLLED ENVIRONMENTS IN RESPONSE TO CHARACTERISTICS OF NUTRIENT SOLUTIONS

C.D. Raper, University of North Carolina, North Carolina State University, School of Agriculture & Life Sciences, Dept. of Soil Science, *Raleigh, North Carolina* 27607 (NCC 2-101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0011, ACUTE FISH BIOASSAY

J. Fisher, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF320510)

To determine the water pollution potential of aircraft fuels and lubricants, missile propellants and their exhaust products, and other AF materials that in sufficient quantity could result in significant detrimental effects on the environment. Transient physiological changes in organisms and toxic effects up to fish kills can serve as indices of potential pollution of the aquatic environment. The results of these studies will serve as a data base upon which environmental impact statements and assessments can be made as they apply to weapon systems using these chemicals, especially where they may possibly enter an aquatic environment. The acute fish bioassay portion of a previous work unit (AMRL-6302-04-11) was transferred to this work unit.

The approach to this effort utilizes experimental concepts developed in water pollution technology and fisheries biology. The applied conditions of these operational AF compounds and the types of test organisms to be utilized determine the methodology for experimentation. Propellant bioassays accomplished with guppies will be repeated using the fathead minnow currently, and other fish species subsequently. The acute toxicity of hydrazine, UDMH, aerozine-50 and MMH, respectively, will be determined. Following the determination of acute toxic levels of these important compounds, the efficacy of various chemicals will be evaluated relative to reversing or reducing the toxicity to fish life.

SUPPORTED BY U.S. Dept. of Defense, Aerospace Medical Research Lab., Toxic Hazards Div.

6.0012, WEAPON DELIVERY INTERFACES FOR ADVANCED FIGHTER AIRCRAFT

P.V. Kulwicki, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF321140)

Develop human engineering criteria for improved weapon delivery from advanced technology aircraft. The FY 78/79 objective focuses on anticipating problem areas, technology transition issues and lead-time constraints associated with aircrew interfaces with tactical fighter systems projected for the 1985-1995 time period. Continued liaison with other laboratory and operational organizations provides input for the planning, organization and accomplishment of exploratory studies of air-to-air and air-to-surface weapon delivery problem areas. This work unit supports multiple AFSC development goals (TW-1 through TW-6), technical need ASD/AFAL 1602-75-04(1), and formal agreements with the Air Force Avionics Laboratory and the Aeronautical Systems Division.

Program objectives are satisfied by periodic review of planning documents and related technical reports, continued liaison with other agency personnel, participation on technical advisory committees (FY78/79 examples are the RECON/STRIKE evaluation group and the Single-Seat Attack working group), and the definition and execution of a coordinated exploratory development involving multiple work elements. During FY 79 a dual thrust is planned in order to (1) continue working with AFAL on the all-aspect gunsight evaluation and the missile launch envelope projects in the area of fire control display techniques for air-to-air weaponry, and (2) develop the plan and documentation for an FY 80 exploration of new techniques for display and control integration. This latter thrust builds on the results of three independent definition studies of display integration options performed under contract in FY 78. The results of these studies will be analyzed in FY 79 to develop the framework for an expanded FY 80 successor development. The results of the dual air-to-air and air-to-surface thrusts of this work unit are planned to be merged in FY 81/82 to furnish a design criteria package applicable to future tactical systems, such as the enhanced tactical fighter.

SUPPORTED BY U.S. Dept. of Defense, Aerospace Medical Research Lab., Human Engineering Div.

6.0013, BRAIN PO2 HEMODYNAMICS AND G-VALVE EFFECTIVENESS WITH HIGH G ONSET *(LDF80-1)*

C.M. Oloff, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 *(DF325820)*

To determine the feasibility of achieving a high gz-onset capability on the DES by manipulation of the crew station (animal platform and restraint system - a pivotal seat). The effectiveness

of the procedure in terms of subject responses will be evaluated by monitoring hemodynamic and brain tissue PO2 responses in the anti-g-suited nonhuman primate.

Four m mulatta will be surgically provided with chronic blood flow probe implants around the left external carotid artery. These animals will be part of a population of rhesus already provided with a chronic skull implant for the insertion of a tissue oxygen probe into the parietal region of the brain. These animals will also be provided with custom-fitted g-suits. The high g-onset technique embodied in this experiment utilizes the existing drive system, but relies upon a minor modification and manipulation of the crew station to produce a rapid change from the gx to gz acceleration vector. The concept is to begin the maneuver with the subject rotating in the relatively benign gx mode. With the rotation rate at, for example, 36 rpm, a 2-second (33 degree/second) pivot of the seated subject to the gz mode will produce a headward acceleration of about 9 gz in that time interval - or an effective g-onset rate of about 4.5 g/second. A variety of g-onset rates (up to 9 g/second) and peak g values (up to 19 gz) can be obtained using the existing equipment by programming the appropriate baseline (gx) rpm and seat pivot (gx more than gz) speed. The efficiency of this procedure will be evaluated in terms of altered brain tissue oxygenation/perfusion under the conditions of acceleration and with either the conventional or advanced (ready pressure, high flow) anti-g suit valve configuration. The funding for this work unit will be placed in work unit 68930433, contract F33615-79-C-0500; contractor - SRL.

SUPPORTED BY U.S. Dept. of Defense, Aerospace Medical Research Lab., Biodynamics & Bionics Div.

6.0014, LIFE-CYCLE COST OF SIMULATED VERSUS ACTUAL AVIONICS MAINTENANCE EQUIPMENT FOR THE F-16 TRAINING PROGRAM

B.W. Cream, U.S. Dept. of Defense, Air Force, Human Resources Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF228260)

To compare the life-cycle cost of F-16 avionics intermediate level training when conducted on simulated versus actual aircraft and maintenance equipment. The results of the analysis will be factors used by the F-16 system program office (SPO) to decide if a training simulator should be procured. The information provided by this study could also potentially impact on the cost and training effectiveness of other planned and existing systems. This analysis was requested by the F-16 SPO. The final product of this program will be a life-cycle-cost technical report.

This program is being conducted in two phases. Phase I (completed in December, 1976) was a general comparison of estimated life-cycle costs for each type of equipment and was conducted in-house by AFHRL/AS. Phase I provided early estimates of the general configuration of the simulated equipment required to accomplish the training objectives and a general comparison of systems costs. Phase I results provided input for initial decisions about equipment procurements and were used to decide if a more detailed life-cycle cost comparison was warranted. Since phase I supported the use of simulated equipment, phase II (July, 78-July, 79) is being conducted. Phase II is a detailed life-cycle cost comparison which will be based on the more extensive training and test station information scheduled to be available during that period.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0015, OPERATIONAL VIROLOGY SUPPORT FOR *MICROBIOLOGY LAB*

V. Knight, Baylor College of Medicine, School of Medicine, Dept. of Microbiology & Immunology, *1200 Moursund Ave., Houston, Texas* 77025 (NAS 9-16280)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lyndon B. Johnson Space Center

6.0016, PROMIS/PJM ASSIGNMENT ANALYSIS

T. Martin, U.S. Dept. of Defense, Air Force, Human Resources Lab., *Brooks Air Force Base, San Antonio, Texas* 78235 (DF234250)

Analyze differences between airman aqe and job difficulty index for pre-PJM, PJM, and AI-assigned airmen in the electronic career field. Analysis of differences will focus on assessing current level of PJM system effectiveness relative to pre-PJM and AI systems. Subsequent objectives - analyze pre-PJM, PJM, AI assignment data for differences among following criteria: (1) attrition, (2) tech. school grades, (3) APRS, (4) aqe-difficulty index match, and (5) promotion intervals.

Initial objective: job difficulty indexes utilized will be those specified by ECLEP study AFHRL TR 73-35. Work request to be forwarded to SM to construct data bases from PACE and PACE/PROMIS files. Data will be analyzed with respect to aqe-difficulty match criterion using linear regression. Subsequent approach: work request to be forwarded to SM to construct data bases from PACE, PACE/PROMIS and UAR files. Data will be analyzed with respect to criteria listed under objectives, using linear regression techniques. Milestones: construct 1st data bases (July, 1979), analyze aqe-difficulty differences (October, 1979), construct 2nd objective data bases (December, 1979), analyze criteria differences (March, 1980), report results in TRS (July, 1980).

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0017, TWO-MAN OXYGEN GENERATOR FOR TACTICAL AIRCRAFT

K.G. Ikels, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas 78235* (DF322940)

This work unit will develop breadboard systems for generating aviators breathing oxygen in flight, with minimal or no requirement for ground support. With current oxygen systems, which include liquid or gaseous oxygen stores, tactical aircraft are constrained in mission duration by storage capacity, in turnaround time by the need for ground servicing, and in basing options by the availability of oxygen supply. The development of on-board in-flight oxygen generation systems will eliminate these constraints, as well as improve systems safety. This exploratory development effort is closely coordinated with the life support SPO (ASD/AEL) and the USN (NADC).

Alternative on-board oxygen-generating (OBOG) concepts will be developed to the breadboard stage, and evaluated in-house for performance and human compatibility. Parametric investigation will be conducted to optimize oxygen production and minimize aircraft weight, power and cooling penalties. Technology hand-off will be made to the life support SPO for engineering development, and operational test and evaluation.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0018, AN INVESTIGATION OF THE BEHAVIORAL *EFFECTS OF TAB*

J.L. Mattsson, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas 78235 (DF324100)*

This work unit is to provide the basis for a cooperative study between the Biomedical Laboratory, Chemical Systems Laboratory, U.S. Army, and the USAF School of Aerospace Medicine, Aerospace Medical Division, for the assessment of the decrements of performance that may occur in primates as a result of administering prophylactic and therapeutic drugs which may prove efficacious against toxic chemical agents. These drug studies are in support of medical chemical defense and flying performance decrement. The initial animal model will be the macaque and the drugs to be investigated initially will be those that constitute the current standard antidote, TmB4, atropine, benactyzine (TAB), or those requested by the USAF SG. Additional animal models and drugs may be selected as appropriate.

Macaques trained to perform useful work (maintain level position on a simple flight simulator, reaction-time tasks, oscilloscope-displayed tracking tasks) will be utilized to develop dose-

response decrement curves for antidotes and/or prophylactics which have been determined efficacious in the treatment of organophosphate exposures.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

***6.0019, AEROMEDICAL DESIGN AND ENGINEERING* ANALYSIS**

G. Olney, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF322120)

To provide aeromedical design and engineering support to major commands for biomedical systems developed by USAFSAM and accepted for operational use. Prepare instructions and maintenance information for equipment users, and prepare technical reports to document completed research and development efforts.

Prepare required acquisition documentation, monitor systems acquisition, provide operation and maintenance instructions to system users, assist in identifying and eliminating operational deficiencies, and prepare required USAFSAM technical reports upon completion of development efforts. This work was previously documented under work units 7755-15-01 and 7996-02-AA.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

***6.0020, ESTABLISHMENT OF STANDARDIZED* EXERCISE STRESS TESTS FOR DETECTION OF CORONARY ARTERY DISEASE IN AIRCREW MEMBERS**

R.A. Wolthuis, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF321620)

The presence of coronary artery disease (CAD) significantly affects the patient's aeromedical disposition. Detection of CAD is thus an important continuing effort, and the use of exercise stress testing is the cornerstone of this effort. This work unit is designed to develop new exercise stress test methods, to implement and evaluate them at USAFSAM, and to promote the use of successful methods in the field.

The approach will consist of several concurrent tasks: 1) treadmill stress ECG reproducibility will be investigated in patients with and without CAD, and the effect of propranolol pretreatment on subsequent ECG response will be studied; 2) software will be developed, tested and implemented for on-line acquisition and analysis of treadmill ECG data; and 3) treadmill ECGs from the past several years will be reviewed to see if patterns emerge that separate those with and those without CAD. These patterns will be correlated with other known risk factors.

SUPPORTED BY U.S. Dept. of Defense, School of Aerospace Medicine, Clinical Sciences Div.

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, AD-2000 INTERACTIVE GRAPHIC SYSTEM TUTORIAL

D.E. Morgan, California State University & Colleges, California Polytechnic State University, School of Engineering & Technology, Dept. of Industrial Engineering, *San Luis Obispo, California* 93407 (NCA 2-678101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

7.0002, DISTRIBUTED OPERATING SYSTEM FOR THE SCIENTIFIC COMPUTER ENVIRONMENT

S.S. Owicki, Stanford University, School of Humanities & Sciences, Dept. of Computer Science, *Stanford, California* 94305 (NCA 2-745102)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

7.0003, DESIGN AND ANALYSIS OF RADIATING *BOUNDARY CONDITIONS AND DIFFERENCE* SCHEMES FOR NONLINEAR FLUID FLOW

A.J. Majda, University of California, Berkeley Campus, School of Letters & Science, Dept. of Mathematics, *Berkeley, California* 94720 (NCA 2-50101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

7.0004, APPLICATION OF PERTURBED ITERATIVE SCHEME (PIS) TO TRANSONIC FLOWS

S.K. Dey, Eastern Illinois University, School of Arts & Sciences, Dept. of Mathematics, *Charleston, Illinois* 61920 (NCA 2-207101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

7.0005, MATHEMATICAL SOFTWARE FOR LINEAR CONTROL AND ESTIMATION THEORY 16257-M

M. Athans, Massachusetts Inst. of Technology, School of Engineering, Dept. of Electrical Engineering & Computer Science, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (DA0G8999; DAAG29-79-C-0031)

To provide both a theoretical numerical analysis and a set of high quality routines for the solution of problems in control and estimation theory. Relevance - control and estimation theory often arises in Army applications such as missile guidance and control and trajectory estimation, fire control and aircraft dynamics.

Linear problems in control theory will be addressed first. Here, the heavy use of numerical linear algebra techniques will form the foundation of the investigation. Portable and robust software will be produced as appropriate.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

7.0006, DEVELOPMENT OF A SURFACE-FITTING PROGRAM FOR COMPUTER-AIDED DESIGN SYSTEMS

J.N. Perkins, University of North Carolina, North Carolina State University, School of Engineering, Dept. of Mechanical & Aerospace Engineering, *Raleigh, North Carolina* 27607 (NCC 1-49)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

7.0007, BRUSHLESS d.c. MOTOR AND POWER CONDITIONER FAULT MODELS

T.W. Nehl, Virginia Polytechnic Inst. & State University, School of Engineering, Dept. of Electrical Engineering, *Blacksburg, Virginia* 24061 (NAS 9-16281)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lyndon B. Johnson Space Center

7.0008, USER DOCUMENTATION OF VICAR/IBIS CONTROL STATEMENTS AND APPLICATION PROGRAMS

L.K. Krebs, Washington State University, School of Arts & Sciences, Dept. of Computer Science, *Administration Bldg., Room 101, Pullman, Washington* 99163 (NCA 2-840101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, COLLISION CROSS-SECTIONS FROM COHERENT TRANSIENT EFFECTS

R.L. Shoemaker, University of Arizona, Graduate School, Optical Sciences Center, *Tucson, Arizona* 85721 (DN975449; NOOO14-79-C-0488)

The purpose of the contract is to develop techniques for determining collisional cross-sections and spectroscopic data. These data are required for gaseous electronic devices such as long-wavelength detectors, long-wavelength lasers, sensitive electric field detectors, etc. These devices are important to naval areas of communications and surveillance.

The construction of the sample cell is being completed. When this is finished, initial experiments to observe optical transient effects in Rydberg atoms will begin.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0002, COMMUNICATIONS - CONDENSATION OF INJECTED ELECTRONS AND HOLES IN SEMICONDUCTORS

T.C. McGill, California Inst. of Technology, Graduate School, Dept. of Applied Physics, *1201 E. California Blvd., Pasadena, California* 91109 (DN475263; N00014-75-C-0423)

The Navy has need for improved solid-state devices in electronic communication and control systems. This research will investigate the properties of semiconductors due to the injection of electrons and holes, with particular emphasis on excitons and radiationless emission effects.

A combined theoretical and experimental program is directed toward the study of excitons and multiexciton complexes in semiconductors. The effects of the excited states of excitons are considered in explaining the binding energy of multiexciton complexes. Also studied are impurity effects in silicon coupled with Jahn-Teller distortion. Temperature- and time-dependent measurements of the recombination/emission process are being used to validate various models for the complex. A tunable dye laser source will be used to investigate the bound exciton states in silicon by observing consequent luminescence. The laser will also be used to investigate the suggested process of non-radiative recombination-induced defect motion.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0003, AN ATTEMPT TO MODEL THE NEBULA G333.6-0.2 WITH A SPHERICALLY SYMMETRIC MODEL

R.H. Rubin, California State University & Colleges, California State University, Fullerton Campus, School of Mathematics Science & Engineering, Dept. of Physics, *800 N. State College Blvd., Fullerton, California* 92631 (NCA 2-253101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

8.0004, IN SITU TEM INVESTIGATIONS OF GRAPHOEPITAXY AND SMALL DEPOSIT PARTICLES

K. Heinemann, Stanford University, School of Engineering, Dept. of Materials Science & Engineering, *Stanford, California* 94305 (NCC 2-111)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

8.0005, SURFACE TENSION PHENOMENA UNDER *LOW- AND ZERO-GRAVITY CONDITIONS*

K. Concus, University of California, Berkeley Campus, School of Letters & Science, Dept. of Physics, *Berkeley, California 94720 (NAG 3-146)*

SUPPORTED BY U.S. National Aeronautics & Space Admin., *Lewis Research Center*

8.0006, *THEORETICAL RESEARCH ON THE ELECTRONIC PROPERTIES OF SOLIDS*

L.M. Falicov, University of California, Berkeley Campus, School of Letters & Science, Dept. of Physics, *Berkeley, California* 94720 (DMR78-03408)

Theoretical studies of the electronic properties of solids, surfaces and interfaces previously supported by NSF grant DMR7680561 will be extended in several independent but related lines of research. These include: studies of electronic structures in inversion layers of many-valley semiconductors; studies of the electronic properties of metallic alloys including the effects of short-range order; studies of the effects of temperature and uniaxial deformation on the antiferromagnetic properties of chromium; studies of the electronic properties of transition metals and rare-earth compounds; and studies of electronic structures on solid surfaces.

First year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0007, *LIGHT SCATTERING STUDIES OF THE FAR INFRARED DIELECTRIC PROPERTIES OF SEMICONDUCTORS*

S. Ushioda, University of California, Irvine Campus, School of Physical Sciences, Dept. of Physics, *Irvine, California* 92664 (DF047080; AFOSR-77-3222)

AF function - aerospace communications, surveillance and detection systems require electrooptical devices which exploit the special properties and interactions of infrared radiation with solid-state materials. Opportunity - infrared materials research has high potential for airborne and satellite applications. Sophisticated electrooptical techniques and characteristics of narrow band-gap compound semiconductors offer promise for electrooptical microcircuitry in the spectral range 10 to 100 micrometers. Objective - the main purpose of this research is to explore the far infrared dielectric properties of several semiconductors, in the bulk and near the surface, by means of inelastic laser light scattering spectroscopy, and to study elementary excitations that contribute to the dielectric properties such as phonons, bulk and surface polaritons, plasmons, and low-lying single particle electronic excitations. How work contributes - the far infrared dielectric (optical) properties of these semiconductors are important to the development of infrared detectors, solid-state lasers, integrated optics and electrooptical techniques and device concepts.

Laser Raman spectroscopy utilizing tunable dye lasers is being used to probe the far infrared properties of semiconductors. For the study of the surface layers of III-V and II-VI compound semiconductors, back scattering Raman spectroscopy is being used. For the study of surface polaritons, thin film layered structures are being used. A computer-controlled spectrometer which is capable of extremely long time signal averaging and digital processing is being utilized to detect very weak Raman scattering. The behavior of surface polaritons, plasmons and phonons is being related to the optical properties and electronic structures of such materials as (Hg, Cd)Te, PbTe, GeTe, GaAs, GaP, InSb, InAs and related semiconducting compounds and alloys.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0008, THE APPLICATION OF PULSED-PUMPED STIMULATED RAMAN GAIN SPECTROSCOPY IN COMBUSTION AND FLOW DIAGNOSTICS

P.E. Perkins, University of Santa Clara, School of Science, Dept. of Physics, *El Camino Rd., Santa Clara, California* 95053 (NCC 2-117)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

8.0009, EXPERIMENTAL STUDY OF ANOMALOUS TRANSPORT IN THE LINEAR-CHAIN TRANSITION-METAL-TRICHALCOGENIDES

N.P. Ong, University of Southern California, School of Letters Arts & Sciences, Dept. of Physics, *3551 University Ave., Los Angeles, California* 90007 (DMR79-05418)

There is growing evidence that transport processes (such as electrical conductivity) in lower dimensional systems involve a new mechanism which is different from that known for conventional metals. This mechanism is related to the occurrence of charge density waves (CDW) in these systems. The MX3 compounds - where M is tantalum (Ta) or niobium (Nb) and X is selenium (Se) or sulfur (S) - form linear chains. A variety of instabilities occur in these systems (namely commensurate and incommensurate charge density wave states, and superconductivity). In addition, niobium triselenide (NbSe3) shows strikingly anomalous transport behavior in the charge density wave phase which cannot be explained by single-particle models. Recently, results from the study of effects of dilute impurities in NbSe3 have provided the strongest evidence to date for the Frohlich (sliding mode) conductivity in a metal. It now appears that NbSe3 and its alloys constitute an ideal system in which current-carrying collective modes (associated with the CDW condensate) can be studied conveniently. The work of the present project includes: 1. Further experiments designed to probe the properties of the nonlinear excitations and microwave absorption mode in NbSe3 (high-current galvanomagnetic behavior, ohmic breakdown under hydrostatic pressure, frequency dependence above 10 GHz, current response to nanosecond pulses). 2. A search using microwave measurements of collective modes in the layered compounds.

This is the first year of a two-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0010, ATMOSPHERIC MEASUREMENTS USING LASER TECHNOLOGY

S. Chiao Yao, Colorado State University, School of Natural Sciences, Dept. of Physics, *Fort Collins, Colorado* 80523 (DN880112; N00014-78-0289)

This contract will provide further development in (a) the single-particle correlated laser Doppler velocimeter (LDV), and (b) the laser time-of-flight velocimeter (LTV) for remote sensing of the atmosphere. Specific tasks are (1) to conduct experiments for the evaluation of the concept and potential of the single-particle correlation for remote wind speed sensing; (2) to develop techniques for overall aerosol concentration and size distribution measurements; (3) to develop automated LDV and LTV systems for daytime use; and (4) to investigate the possibility of obtaining new information of atmospheric turbulence in a short time-scale of the order of milliseconds.

To extend the existing techniques of single-particle correlation LDV and the laser time-of-flight velocimeter at the Colorado State University for the simultaneous assessment of the wind speed and the aerosol concentration in the atmosphere. In situ particle sizing will be done by a two-angle intensity ratio particle-sizing spectrometer. Instrument development and evaluation, and field experiments are to be emphasized.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

8.0011, EUV PLASMA SPECTROSCOPY

G.A. Doschek, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN980042)

Determine physical conditions such as electron temperature, density, turbulence, and mass motions in million degree laboratory plasmas. Develop new laboratory spectrographs based on recent developments in astronomical detector technology.

Modify and adapt existing solar physics spectrographs and hardware to laboratory facilities. Plasmas to be studied include laser-produced plasmas, low-inductance vacuum spark plasmas, electron-ion beam plasmas and Tokamak plasmas.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

8.0012, RADIATION LOSS MECHANISMS

K.G. Whitney, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN980323)

X-radiation wall loss mechanisms will be calculated for exploded wire housings in order to determine wall plasma conditions under which a moderate atomic number wall material comes into radiative equilibrium.

Photo-ionization cross-sections as functions of the ionization state will be determined for iron and its heating by X-irradiation from an aluminum plasma source calculated. Plasma conditions under which the optical emission from the iron M-shell comes into radiative equilibrium will be determined. Some effects on this emission of temperature and density gradients within the plasma will also be calculated.

SUPPORTED BY U.S. Dept. of Defense, Navy

8.0013, THEORETICAL SOLID-STATE PHYSICS

M.H. Cohen, University of Chicago, School of Physical Sciences, Dept. of Physics, *5734 S. Ellis Ave., c/o Hinds Geophysics Lab., Chicago, Illinois* 60637 (DMR77-12637)

Theoretical studies of condensed matter systems previously supported by NSF grant DMR-7621298 will be continued and extended in new directions. Topics to be investigated include the following: (a) one-dimensional and nearly one-dimensional systems with emphasis on electron-lattice interaction, transport and magnetic properties of one-dimensional materials and on nonlinear dynamics of a one-dimensional field theory; (b) properties of liquid and superfluid helium-3 including study of the pairing mechanism and a search for an explanation of the phase diagram in zero and finite magnetic fields; (c) disordered systems including an attempt to explain static and dynamical properties of the spin glasses in a cluster mean field theory and to formulate an itinerant model of a spin glass; (d) critical and collective phenomena including work on the equilibrium properties and dynamics of classical quantum mechanical systems near critical points; (e) dynamics of fluids including work centered on kinetic theory approaches to the description of quantum and classical fluids and plasmas; (f) metal-insulator transition including work on a new method for deriving the Green's function for the Hubbard model.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0014, ASTROPHYSICAL APPLICATIONS OF MICROSCOPIC AND MANY-BODY PHYSICS

D. Pines, University of Illinois, Urbana Champaign Campus, School of Liberal Arts & Sciences, Dept. of Physics, *Urbana, Illinois* 61801 (PHY78-04404)

Research in theoretical astrophysics initiated under NSF grant PHY75-08790 AO2 will be continued. Topics to be investigated include: A. Fundamental Studies of Matter at High Densities; B. Physics of X-ray Sources; C. Dynamical Processes in Neutron Stars and Planets; D. Structure and Evolution of Degenerate Dwarfs; and E. Other topics.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0015, KINETICS OF PHASE TRANSITIONS
H. Sato, Purdue University, School of Materials Engineering, *Life Sciences Bldg., West Lafayette, Indiana* 47907 (DMR79-03932)

Research previously supported by DMR7621497.

Theoretical research of irreversible phenomena in crystalline solids, aimed at elucidating nonlinear processes which occur in states far from equilibrium, will be carried out. The method to be used is the Path Probability method of irreversible statistical mechanics, and the phenomena to be studied are those of specific interest in materials science, such as the kinetics of order-disorder transformations, the nature of glass transitions and fast ionic transport in solid electrolytes. Through the study of the above problems, the foundations of kinetic processes will be reexamined. Based on the progress made concerning the general description of kinetic processes which occur in systems undergoing phase transitions of second order, basic processes involved in the phase transitions of first order, such as nucleation processes, crystal growth and the necessary theoretical tools for these processes, will be examined.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0016, ELECTRONIC AND VIBRATIONAL SPECTRA OF SOLIDS
A.K. Ramdas, Purdue University, School of Science, Dept. of Physics, *Executive Bldg., West Lafayette, Indiana* 47907 (DMR77-27248)

Research previously supported by DMR76-04775.

A series of investigations, utilizing Raman and Brillouin scattering and infrared spectroscopy, will be undertaken to study the vibrational spectra of a variety of solids. Some unusual properties of phonons in the center of the Brillouin zone will be studied as well as local modes associated with crystal imperfections such as lithium in silicon and germanium. These investigations will be carried out in the absence and in the presence of uniaxial stress. Also, Brillouin scattering in silicon carbide polytypes will be undertaken.

The research on impurity states will include a study of lithium and lithium-oxygen complexes in silicon and germanium, two electron (hole) excitations of double donors (acceptors), and the electronic Raman effect of defects in silicon.

Also, the electronic and vibrational spectra of semiconductors doped by nuclear transmutation will be investigated.

This is the first year of a 3-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0017, LIGHT SCATTERING STUDIES
A.D. Compaan, Kansas State University, School of Arts & Sciences, Dept. of Physics, *Anderson Hall, Manhattan, Kansas* 66502 (DN075296; N00014-80-C-0419)

To develop a better understanding of the time-dependent physical processes in a rapidly heated surface. Rapid surface heating impacts Navy/Marine capability through improved materials processing for electronic devices and metal surface modification for corrosion control.

Scattered laser light will be examined as a means to study surface physical processes during and following a rapid heating pulse. The Stokes/anti-Stokes ratio of the phonon Raman lines will be examined as a measure of lattice temperature, the Raman intensity as a measure of crystallinity, the Raman line-shape as a probe of thermal expansion and anisotropic strain, and the inelastic scattering as a measure of non-equilibrium carried distributions.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0018, ENERGETIC PARTICLE ACCELERATION IN SOLAR FLARES
C. Chang, University of Maryland, College Park Campus, School of Arts & Sciences, Dept. of Physics & Astronomy, *College Park, Maryland* 20742 (NAG 5-135)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

8.0019, HIGH-TEMPERATURE PLASMAS
C.S. Liu, University of Maryland, College Park Campus, School of Arts & Sciences, Dept. of Physics & Astronomy, *College Park, Maryland* 20742 (DN780195; N00014-75-C-0309)

Theoretical and numerical investigations are performed on the dynamics and stability of high-temperature plasmas and charged particle beams. Areas of particular concern are the generation and manipulation of intense relativistic electron beams, intense ion beams, laser-plasma interaction and plasma spectroscopy.

This program involves theoretical studies of (a) the equilibrium, stability and transport properties of intense ion beams and relativistic electron beams, (b) nonlinear effects, as they pertain to microstability behavior and anomalous transport in high-temperature plasmas, and (c) studies of radiation processes and atomic excitations by electron collisions.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

8.0020, HIGH RESOLUTION ULTRAVIOLET CROSS-SECTION MEASUREMENTS OF OZONE
W.H. Parkinson, Harvard University, Cambridge Campus, School of Arts & Sciences, Dept. of Astronomy, *Cambridge Station, Cambridge, Massachusetts* 02138 (NAG 5-144)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

8.0021, METALLIC MAGNETISM - EFFECTS OF PRESSURE AND OF MAGNETIC IMPURITIES IN SUPERCONDUCTORS
R.P. Guertin, Tufts University, Medford Campus, School of Arts & Sciences, Dept. of Physics, *Medford, Massachusetts* 02155 (DMR79-06659)

Experiments will be performed to investigate single impurity and collective magnetic effects in intermetallic compounds and alloys. The experiments are divided into two groups: the measurement of magnetic properties at high hydrostatic pressures and in high magnetic fields, and investigations of magnetic impurity effects in superconductors at very low temperatures and at high pressures.

In the first category, measurements will be made of the magnetization and susceptibility of the weak ferromagnets praesodymium selenide and non-stoichiometric praesodymium phosphide. In ferromagnetic uranium-thorium antimonide the application of pressure is expected to give rise to a ferroto-paramagnetic transition accompanied by a valence charge for the uranium ion. Also, a search for diamagnetic anomalies in high-pressure phase of cuprous chloride will be carried out. In the second category, studies will be made of magnetic effects of representative iron groups, rare-earth and actinide impurities in thorium and other superconducting hosts. Measurements of the superconducting-normal phase boundary as a function of high pressure for two re-entrant cerium impurity Kondo systems will also be performed.

Research previously supported by DMR 7705959 A01.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0022, EXPERIMENTAL STUDY OF THE PHYSICAL AND ELECTRONIC PROPERTIES OF LIQUID TRANSITION METALS AND TRANSITION-LIKE METALS AND ALLOYS

J.B. Van Zytveld, Calvin College, Undergraduate School, Dept. of Physics, *1331 Franklin St. S.E., Grand Rapids, Michigan* 49506 (DMR79-09969)

Certain electronic and physical properties of solid and liquid transition metals and transition-like metals will be measured at high temperatures. Experiments include: measurements of resistivity and thermopower of the iron series transition metals from room temperature to above their melting points; measurements of resistivity and thermopower of solid and liquid europium and also the liquid allow strontium-barium; measurements of the density of liquid europium and ytterbium, and also of the liquid alloys magnesium-calcium, magnesium-strontium and magnesium-barium. These measurements will permit tests of recent theoretical work on the electronic and thermodynamic properties of liquid metal systems.

This is the first year of a three-year continuing grant; research was previously supported by DMR 7705213.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0023, INDUSTRY-UNIVERSITY COOPERATIVE RESEARCH ACTIVITY - ION CHANNELING STUDIES OF SOLIDS

R.S. Alexander, Wayne State University, School of Liberal Arts, Dept. of Physics, *4841 Cass Ave., Detroit, Michigan* 48202 (DMR80-07248)

An experimental research program to investigate solids and solid-liquid interfaces using ion channeling techniques will be initiated. The problems to be investigated include: the lattice location and possible clustering of magnetic impurity atoms in spin glasses; the influence of diffused impurities on the quality of semiconductor single crystals used in diode-lasers (ion channeling provides a sensitive probe of crystal quality which is important for device performance); and the lattice location of impurities and the nature of defects at solid-liquid interfaces. Initially, the technical problems for this type of experiment will be investigated using thin silicon crystals which are very well characterized and understood.

The second two projects are collaborative research efforts with scientists at the General Motors Research Laboratories.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0024, STUDIES OF ACOUSTICAL PROPERTIES OF BULK POROUS FLEXIBLE FIBROUS MATERIALS

R.F. Lambert, University of Minnesota, Minneapolis Campus, School of Engineering, Dept. of Electrical Engineering, *105 Morrill Hall, Minneapolis, Minnesota* 55455 (NAG 3-161)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

8.0025, STUDY OF THE INTENSITY AND ENERGY DISTRIBUTION OF ELECTRONS IN A LOW-ENERGY MAGNETOMETER

G.H. Rayborn, University of Southern Mississippi, School of Science & Technology, Dept. of Physics & Astronomy, *Hattiesburg, Mississippi* 39401 (NAS 1-16503)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

8.0026, STUDIES OF SOLAR WIND MINOR IONS

J.V. Hollweg, University System of New Hampshire, University of New Hampshire, School of Engineering & Physical Sciences, Dept. of Physics, *Durham, New Hampshire* 03824 (NAG 5-130)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

8.0027, GRAVITATION, RELATIVITY AND COSMOLOGY

D.T. Wilkinson, Princeton University, Graduate School, Dept. of Physics, *205 Nassau Hall, Princeton, New Jersey* 08540 (PHY78-21595)

Theoretical and experimental research on gravitation physics currently supported under NSF grant PHY76-82662 A01 will be continued. Among the topics in relativistic astrophysics, gravitation, and cosmology to be pursued are: 1. Studies of the shape of the sun (Dicke); 2. statistics of galaxy clustering (Groth, Peebles); 3. galactic halos and galactic evolution. CCD spectrophotometry of high redshift clusters (Loh, Wilkinson); 4. systematic sampling of galaxy redshifts, (Peebles); and 5. balloon measurements of 3 degrees K background radiation isotropy (Wilkinson).

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0028, COLLECTIVE ION ACCELERATION AND STRUCTURE OF ELECTRON BEAM FILAMENTS

V. Nardi, Stevens Inst. of Technology, School of Engineering, Dept. of Physics, *Castle Point Station, Hoboken, New Jersey* 07030 (DN075002; N00014-80-C-0061)

The Navy needs quantitative information on methods to generate intense ion beams with energies up to 1 GeV for directed energy applications, sources of intense radiation through impact with targets, new sources of energy via interaction with pellets, etc. The extremely high power level of the plasma focus as an inductive generator of ion and electron beams is now generally recognized. Not so well known are the internal structure and the dynamical properties of the filaments and their bearing on possible focalization methods of the resulting ion and electron beams.

A broad experimental program with associated theoretical analysis will be pursued to determine the structure, propagation and energy deposition of the electron and ion beams generated in the plasma focus. A test of scaling laws will be made for the electron beam power as a function of the peak voltage (10 kV to 50 kV) on the electrodes, of pressure in the discharge and of impurity concentration in the discharge chamber. The detailed distribution, in space, of particles and of particle energy within a beam filament will be obtained by using target plastic materials. This method permits the following of the evolution of the filament structures through different stages.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0029, NAVY ENVIRONMENT - IONOSPHERIC ELECTRIC FIELD

M. Brook, New Mexico Inst. of Mining & Technology, Graduate School, Dept. of Physics, *Campus Station, Socorro, New Mexico* 87801 (DN675282; N00014-76-C-0574)

The aim of this research is to measure horizontal gradients of the ionized upper strata of the atmosphere including the ionosphere. It is necessary to obtain these data with longer term measurements than are possible with balloons for improving the predictive capability of ionospheric models. Ionospheric modeling is needed for design and operation of naval communication and surveillance systems.

In a reasonably pollution-free area (flat open-space of New Mexico) a 10 km antenna will be strung at a height of seven meters and insulated from the ground. Horizontal gradients in the ionosphere are estimated to be 10 mV/m, which figure is attenuated by a factor of a thousand 7m above the ground. An antenna of 10 km length will aquire a voltage drop of one tenth of a volt, an adequate magnitude to measure.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0030, TECHNICAL SERVICES AND MATERIALS FOR THE LIBRARY OF GODDARD INSTITUTE FOR SPACE STUDIES
J.H. Yavarkousky, Columbia University, Graduate School of Arts & Sciences, Dept. of Physics, *Broadway & W. 116th St., New York, New York* 10027 (NAS 5-26398)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

8.0031, A THEORETICAL INVESTIGATION OF ATOMIC SCATTERING PROCESSES
L. Spruch, New York University, Washington Square & University College of Arts & Sciences, Dept. of Physics, *100 Washington Sq. E., New York, New York* 10003 (PHY79-10413)

Research in theoretical atomic physics initiated under NSF grant PHY77-10131 will be continued. Among the topics to be investigated are: 1. Effect of target ionization on electron-atom scattering in a radiation field. 2. Electron-ion scattering in a radiation field. 3. Generalization of the low-frequency approximation for scattering in a laser field. 4. Variational principle for the scattering length for target ground-state wave function imprecisely known. 5. Analytic form for the generalized oscillator strength. 6. Lamb shift for an electron image bound by a conducting wall. 7. Charge transfer at high but not asymptotically high impact velocities. 8. Variational principle for charge transfer for target ground-state wave function imprecisely known. 9. Extreme principle estimation of transition rates for the emission of photons by low Z excited atoms in intense magnetic fields. 10. Electric dipole polarizability of the neutron.

This is the first year of a four-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0032, ENERGETIC PARTICLE ACCELERATION RESEARCH
M.A. Forman, State University of New York, Stony Brook Campus, School of Arts & Sciences, Dept. of Earth & Space Sciences, *Stony Brook, New York* 11790 (NAS 5-26395)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

8.0033, MODEL SYSTEMS
B. McCoy, State University of New York, Stony Brook Campus, School of Arts & Sciences, Dept. of Physics, *Stony Brook, New York* 11790 (DMR79-08556)

Research previously supported by DMR7707863.

Theoretical research on systems with an infinite number of degrees of freedom will be carried out, including both statistical mechanical systems and quantum field theories. In particular, the recently calculated n-spin correlations of the two-dimensional Ising model at zero magnetic field will be used to extend the studies of both spin correlation and free energy for non-zero field both below and above the critical temperature. Also, the two-dimensional Heisenberg model and four-dimensional gauge theories will be investigated. The emphasis will be on obtaining exact results on the properties of these systems.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0034, NAVY ENVIRONMENT - ATMOSPHERIC WATER VAPOR
T. Ashworth, South Dakota School of Mines & Technology, School of Engineering, Dept. of Physics, *Rapid City, South Dakota* 57701 (DN323084; N00014-75-C-0214)

To fill the need for an expendable, in situ, humidity sensor for very low atmospheric humidity to be used in conjunction with the development of remote sensing techniques for water vapor in the atmosphere. The aim of this research is to attack the complex problems involved in the development, testing, calibration and modification of such sensors. The research will benefit Navy efforts to cope with the water vapor problems that affect modern weaponry in the stratosphere.

The present research is addressing basic questions with regard to very low atmospheric humidity. Under study is: (1) the development of a more detailed understanding of the process of physical adsorption; (2) the state of water molecules on an absorbent; and (3) the mechanisms by which adsorbed water molecules influence the physical properties of a substrate. The approach involves: (1) basic study of moisture adsorption by gravimetric determination of the isotherms; (2) determination of the usable range and limitations of a piezoelectric sensor to monitor moisture adsorption; and (3) investigate the relationship between basic physical properties and moisture content.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

SOCIAL SCIENCES

Includes Social Sciences (general); Administration and Management; Documentation and Information Science; Economics and Cost Analysis; Law and Political Science; and Urban Technology and Transportation.

9.0001, AUTOMATICITY AND SKILL ACQUISITION IN A DUAL-TASK ENVIRONMENT
J.E. Regan, California State University & Colleges, San Jose State University, School of Social Sciences, Dept. of Psychology, *Washington Sq., San Jose, California* 95192 (NAG 2-84)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, OPERATION AND MAINTENANCE OF THE NASA-OWNED 1.5 METER TELESCOPE LOCATED AT MT. LEMMON, ARIZONA
H.P. Larson, University of Arizona, Lunar & Planetary Lab., *Tucson, Arizona* 85721 (NAS 2-10890)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

10.0002, A SEARCH FOR AN X-RAY HALO IN ABELL 2255
J. Scott, University of Arizona, School of Liberal Arts, Dept. of Astronomy, *Tucson, Arizona* 85721 (NAG 8-387)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

10.0003, ACQUIRE AND ANALYZE OBSERVATIONS BEFORE AND DURING THE FLASH PHASE OF SOLAR FLARES
S.F. Martin, California State University Foundation, *Northridge, California* (DF044490; F49620-78-C-0025)

AF function - solar flares produce high speed particle (proton-electron) streams which cause geomagnetic storms, communications problems and high radiation levels for orbiting spacecraft. Deficiency - no theory or model of solar flares exists which can consistently predict flare occurrence and observed phenomena. Objective - to forecast solar flares and erupting filaments. Contribution - this project will acquire new observations of solar flares and use of these and existing data to develop a flare theory for real-time forecasts.

Pre-flare changes in filaments and faint coronal features during the rise of flares to maximum will be detected, recorded and analyzed. A conceptual model of a solar flare, based on the Kopp and Pneumann model of post-flare loops, will be developed. Trial periods of real-time forecasting of flares and erupting filaments will be made.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

10.0004, DYNAMICS OF THE RINGS OF SATURN
F.H. Shu, University of California, Berkeley Campus, School of Letters & Science, Dept. of Astronomy, *Berkeley, California* 94720 (NCA 2-50102)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

10.0005, STUDY OF X-RAY SUPERBUBBLE IN CYGNUS USING DATA FROM HEAO 1
Unknown, University of Colorado, Boulder Campus, Graduate School, *1200 University Ave., Boulder, Colorado* 80302 (NAG 8-384)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

10.0006, SPECTRA OF WHITE DWARF X-RAY SOURCES
H.L. Shipman, University of Delaware, School of Arts & Sciences, Dept. of Physics, *Newark, Delaware* 19711 (NAG 8-390)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

10.0007, CONSTRUCTION OF A DATA SYSTEM FOR A CHARGE COUPLED-DEVICE CAMERA
C.B. Pilcher, University of Hawaii System, Manoa Campus, School of Arts & Sciences, Dept. of Physics & Astronomy, *2444 Dole St., Honolulu, Hawaii* 96822 (NASW 3460)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

10.0008, RADIO GALAXIES IN POOR ZWICKY CLUSTERS
J.O. Burns, University of New Mexico, School of Arts & Sciences, Dept. of Physics & Astronomy, *University Hill N.E., Albuquerque, New Mexico* 87106 (NAG 8-386)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

10.0009, INVESTIGATIONS OF GALACTIC AND EXTRAGALACTIC RADIO FREQUENCY BURSTS
I.R. Linscott, Dudley Observatory, *69 Union Ave., Schenectady, New York* 12308 (AST79-11142)

Radio frequency bursts of galactic and extragalactic origin will be investigated using the dispersion deconvolution signal processing that has been recently developed. Preliminary observations to detect weak, highly dispersed radio bursts from the directions of Virgo A, and Sagittarius A at 327 MHz using a preliminary configuration of the dispersion signal processing have been made on Dudley Observatory's 30-meter diameter radio telescope. The current combination of hardware and software signal processing has a high sensitivity for radio bursts but a very low (10 to the minus 4th power) detection efficiency. The detection efficiency will be improved and searches will be made for additional sources of asynchronous radio bursts. Radio bursts carry information on the density and turbulence of plasmas both in the vicinity of the burst source and within interstellar or intergalactic clouds. The radio bursts then provide a singular opportunity to measure the physical conditions with these plasmas. The physical conditions will be estimated by measuring the plasma dispersion and scintillation constants of the individual radio bursts. These constants will be measured using a simple extension of the current deconvolution signal processing incorporating additional high-speed arithmetic processing.

This is s continuation of AST-7807406.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

10.0010, STUDY OF EINSTEIN OBSERVATIONS OF HII REGION/MOLECULAR CLOUD COMPLEXES
M. Simon, State University of New York, Stony Brook Campus, School of Arts & Sciences, Dept. of Earth & Space Sciences, *Stony Brook, New York* 11790 (NAG 8-388)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

10.0011, INVESTIGATIONS OF THE PUPPIS A X-RAY EMISSION LINE SPECTRUM
P.F. Winkler, Middlebury College, Graduate School, Dept. of Physics, *Middlebury, Vermont* 05753 (NAG 8-389)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

GENERAL

11.0001, FOURTEENTH-CENTURY GREEK ASTRONOMICAL TABLES AND THEIR RELATION TO ISLAMIC SOURCES - DOCTORAL DISSERTATION RESEARCH
J.A. Barham, Harvard University, Cambridge Campus, School of Arts & Sciences, Dept. of History of Science, *Cambridge Station, Cambridge, Massachusetts* 02138 (SES80-20578)

The purpose of this dissertation is to analyze those fourteenth century Greek astronomical tables which show the influence of Arabic astronomy and, by comparing parameters, to establish as precisely as possible the relationship of each Greek text to specific Islamic sources. In particular, it is hoped that it will be possible to verify the suspected dependence of the tables found in the work of George Chrysokokkes and of Theodore Meliteniotes upon the zij-i Ilkhani of Nasir ad-Din at Tusi, and in so doing lend additional support to the hypothesis of a Greek intermediary in the transmission to Italy of concepts and parameters formulated by Tusi and his successors.

SUPPORTED BY U.S. National Science Foundation, Directorate for Biological Behavioral & Social Sciences, Div. of Social & Economic Sciences

11.0002, DEVELOP/IMPLEMENT A DATA MANAGEMENT SYSTEM FOR USE WITH A LANDSAT-BASED INFORMATION SYSTEM
B.J. Turner, Pennsylvania State University, University Park Campus, School of Forest Resources, *102 Ferguson Bldg., University Park, Pennsylvania* 16802 (NAS 5-26468)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

11.0003, STARLAB FACILITY DEFINITION TEAM (FDT)-CONTINUING STUDY OF SCHEMATIC DESIGN AND SCIENTIFIC APPLICATIONS
Unknown, University of Virginia, Graduate School, *Garrett Hall, Charlottesville, Virginia* 22903 (NAS 5-26476)

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Scientific and Technical Aerospace Reports

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01 AERONAUTICS (GENERAL)

No abstracts in this category.

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N81-25035 Stanford Univ., Calif.

THE OBLIQUE WING BY MATCHED ASYMPTOTIC EXPANSIONS Ph.D. Thesis

Henry Philips Day, Jr. 1981 117 p

Avail: Univ. Microfilms Order No. 8108910

The incompressible inviscid flow over an oblique wing is found for large aspect ratio by perturbing the two dimensional solution. Such a perturbation is singular, so the method of matched asymptotic expansions is used. The lifting problem is solved for the velocity potential, for general planforms and twist. The mid chord line of the wing is assumed straight. Formulas are derived for distribution of circulation, for total lift and moments and for forces acting on wing sections oriented either parallel to the flight direction or perpendicular to the wing. Specific equations for four planforms are shown to illustrate the effect of tip shape on the breakdown of the approximation near the three dimensional tip flow. Lift distributions are shown for the untwisted elliptic wing, for four aspect ratios and four angles of sweep.

Dissert. Abstr.

N81-25036*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SHOCKLESS DESIGN AND ANALYSIS OF TRANSONIC BLADE SHAPES

Djordje S. Dulikravich and Helmut Sobieczky (DFVLR) 1981 13 p refs Presented at the 14th Fluid and Plasma Dyn. Conf., Palo Alto, Calif., 23-25 Jun. 1981; sponsored by the American Inst. of Aeronautics and Astronautics

(NASA-TM-82611; E-861) Avail: NTIS HC A02/MF A01 CSCL 01A

A fast computer program was developed to eliminate the shocks by slightly altering portions of the contour of a given airfoil in the cascade. The program can be used in two basic modes: (1) An analysis for steady, transonic, potential flow through a given planar cascade of airfoils and (2) a design for converting a given cascade into a shockless transonic cascade. The design mode can automatically be followed by the analysis mode, which confirms that the flow field is shock free. The program generates its own multilevel boundary conforming computational grids and solves a full potential equation in a fully conservative form. The shockless design is performed by implementing Sobieczky's fictitious-gas elliptic continuation concept. E.A.K.

N81-25037*# Washington Univ., Seattle.

AN EXPERIMENTAL INVESTIGATION OF THREE DIMENSIONAL LOW SPEED MINIMUM INTERFERENCE WIND TUNNEL FOR HIGH LIFT WINGS

Shojiro Shindo and Robert G. Joppa Sep. 1980 24 p refs (Grant NsG-2260)

(NASA-CR-164439) Avail: NTIS HC A02/MF A01 CSCL 01A

As a means to achieve a minimum interference correction wind tunnel, a partially actively controlled test section was experimentally examined. A jet flapped wing with 0.91 m (36 in) span and $R = 4.05$ was used as a model to create moderately high lift coefficients. The partially controlled test section was simulated using an insert, a rectangular box 0.96 x 1.44 m (3.14 x 4.71 ft) open on both ends in the direction of the tunnel air flow, placed in the University of Washington Aeronautical Laboratories (UWAL) 2.44 x 3.66 m (8 x 12 ft) wind tunnel. A tail located three chords behind the wing was used to measure the downwash at the tail region. The experimental data indicates that, within the range of momentum coefficient examined, it appears to be unnecessary to actively control all four sides of the test section walls in order to achieve the near interference free flow field environment in a small wind tunnel. The remaining wall interference can be satisfactorily corrected by the vortex lattice method. Author

N81-25038*# Grumman Aerospace Corp., Bethpage, N.Y.

AN ALTERNATING-DIRECTION-IMPLICIT ALGORITHM FOR THE UNSTEADY POTENTIAL EQUATION IN CONSERVATION FORM Final Report

Richard R. Chipman Jul. 1980 43 p refs (Contract NAS2-10487)

(NASA-CR-166152) Avail: NTIS HC A03/MF A01 CSCL 01A

An implicit finite difference scheme for an efficient computation of unsteady potential flow about airfoils is presented. The formulation uses density and velocity potential as dependent variables, and is cast in conservation form to assure the theoretically correct determination of shockwave location and speed. To enable boundary conditions to be imposed directly on the airfoil surface, a time varying sheared rectilinear coordinate transformation is employed. Calculated time history solutions on a pulsating airfoil are compared with the results of another unsteady transonic code. It is concluded that the method has excellent numerical stability and gives accurate solutions with sharply resolved shocks. E.A.K.

N81-25039*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.

HOMING PERFORMANCE COMPARISON OF SELECTED AIRFRAME CONFIGURATIONS USING SKID-TO-TURN AND BANK-TO-TURN STEERING POLICIES Final Contractor Report, 3 Jan. 1979 - 4 Jan. 1980

R. T. Reichert Washington NASA May 1981 170 p refs

(NASA Order-L-75242-A)
(NASA -CR-3420) Avail: NTIS HC A08/MF A01 CSCL 01A

The impact of airframe lift capability and of autopilot and guidance filter response times was evaluated. Some comparisons are made with skid to turn steering. It is shown that bank to turn steering can provide acceptable performance provided sufficient bank rates can be tolerated. T.M.

N81-25040*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

EXPERIMENTAL AND ANALYTICAL STUDY OF THE LONGITUDINAL AERODYNAMIC CHARACTERISTICS OF ANALYTICALLY AND EMPIRICALLY DESIGNED STRAKE-WING CONFIGURATIONS AT SUBCRITICAL SPEEDS

John E. Lamar and Neal T. Frink Jun. 1981 226 p refs
(NASA-TP-1803; L-14041) Avail: NTIS HC A11/MF A01 CSCL 01A

Sixteen analytically and empirically designed strakes have been tested experimentally on a wing-body at three subcritical speeds in such a way as to isolate the strake-forebody loads from the wing-afterbody loads. Analytical estimates for these longitudinal results are made using the suction analogy and the augmented vortex lift concepts. The synergistic data are reasonably well estimated or bracketed by the high- and low-angle-of-attack vortex lift theories over the Mach number range and up to maximum lift or strake-vortex breakdown over the wing. Also, the strake geometry is very important in the maximum lift value generated and the lift efficiency of a given additional area. Increasing size and slenderness ratios are important is generating lift efficiently, but similar efficiency can also be achieved by designing a strake with approximately half the area of the largest gothic strake tested. These results correlate well with strake-vortex-breakdown observations in the water tunnel. M.G.

N81-25041*# Kansas Univ., Lawrence. Flight Research Lab.

ICING TUNNEL TESTS OF A GLYCOL-EXUDING POROUS LEADING EDGE ICE PROTECTION SYSTEM ON A GENERAL AVIATION AIRFOIL

David L. Kohlman, William G. Schweikhard, Alan E. Albright, and Peggy Evanich May 1981 37 p refs
(Grant NAG3-71)
(NASA-CR-164377; KU-FRL-464-1) Avail: NTIS HC A03/MF A01 CSCL 01A

A glycol-exuding porous leading edge ice protection system was tested. Results show that the system is very effective in preventing ice accretion (anti-ice mode) or removing ice from an airfoil. Minimum glycol flow rates required for anti-icing are a function of velocity, liquid water content in the air, ambient temperature, and droplet size. Large ice caps were removed in only a few minutes using anti-ice flow rates. It was found that the shed time is a function of the type of ice, size of the ice cap, angle of attack, and glycol flow rate. Wake survey measurements show that there is no significant drag penalty for the installation or operation of the system tested. E.A.K.

N81-25042# Washington Univ., Seattle. Dept. of Aeronautics and Astronautics.

PASSAGE THROUGH RESONANCE Interim Report

Jerry Kevorkian 1980 34 p refs
(Contract F49620-79-C-0141; AF Proj. 2304)
(AD-A094586; AFOSR-81-0056TR; ISBN-0-12-493260-0) Avail: NTIS HC A03/MF A01 CSCL 12/1

Problems exhibiting passage through resonance are surveyed. Such problems are described by systems of weakly nonlinear ordinary differential equations with slowly varying coefficients which are either given or obey subsidiary differential equations. Resonance is exhibited by the occurrence of a zero divisor in the solution when two frequencies are in a critical ratio. Since frequencies evolve slowly with time, the system is said to pass through resonance. The zero divisor does not correspond to a real singularity; rather, it indicates that the assumed form of the solution is inappropriate near the resonance condition.
Author

N81-25043# Hughes Helicopters, Culver City, Calif.

WIND TUNNEL TESTS OF LARGE- AND SMALL-SCALE ROTOR HUBS AND PYLONS Final Report, Sep. 1977 - Apr. 1980

A. H. Logan, R. W. Prouty, and D. R. Clark (Analytical Methods, Inc.) Apr. 1981 136 p refs
(Contract DAAJ02-77-C-0055; DA Proj. 1L2-62209-AH-76)
(AD-A098510; HH-80-15; USAAVRADCOM-TR-80-D-21) Avail: NTIS HC A07/MF A01 CSCL 20/4

The Army YAH-64 and UH-60A helicopters were studied to determine optimum wind tunnel test procedures and to expand the experimental data base on drag reduction for rotor hubs and pylons. Full- and reduced-scale models of these helicopters were fabricated. The Hub Pylon Evaluation Rig (HPER) and the Generalized Rotor Modeling System (GRMS) were used for the experimental testing, conducted in the NASA/Langley V/STOL wind tunnel. Only the YAH-64 models underwent wind tunnel testing during this contracted effort. Plans are under way for testing of the UH-60A models. All configurations were subjected to viscous analysis using Program DRAG, a configuration modeling program. This effort included evaluation of hub fairings, pylon fences, rotor wake flow, hub rotation, engine air flow, fuselage parasite drag, empennage flow, and stabilators. The DRAG program was validated by correlation of predicted and experimentally obtained surface pressures. GRA

N81-25044# ARO, Inc., Arnold Air Force Station, Tenn.

INVESTIGATIONS OF FREE-JET TEST REQUIREMENTS AND TECHNIQUES WITH EMPHASIS ON THE ADAPTABLE JET STRETCHER Final Report, 1 Oct. 1978 - 30 Sep. 1980

R. J. Matz and E. M. Kraft Apr. 1981 76 p refs
(AD-A098710; AEDC-TR-80-35) Avail: NTIS HC A05/MF A01 CSCL 20/4

Preliminary investigations of approaches that will permit relatively large air-breathing engine/inlet/forebody systems to be tested in free-jet test facilities were accomplished. Bodies immersed in a supersonic free jet experience unacceptable flow distortions as a result of (1) bow shock reflections from the constant pressure free-jet boundary and (2) waves emanatins from the nozzle lip because of exit plume static pressure mismatch. The adaptable jet stretcher can potentially eliminate these disturbances over a range of test conditions. A rigorous mathematical proof of a jet stretcher convergence to the desired interference-free geometry was developed for supersonic flow. Convergence was also demonstrated by a computer experiment for a slender axisymmetric body in an off-design supersonic jet stretcher. Near field flow disturbances were reduced to an acceptable level after two readjustments of the jet stretcher geometry. GRA

N81-25045# Ballistic Research Labs., Aberdeen Proving Ground, Md.

SURFACE PRESSURE MEASUREMENTS ON A PROJECTILE SHAPE AT MACH 0.908 Final Report

Lyle D. Kayser Feb. 1981 33 p refs
(DA Proj. 1L1-61102-AH-43)
(AD-A098589; AD-E430597; ARBRL-MR-03079) Avail: NTIS HC A03/MF A01 CSCL 19/1

Measurements of wall static pressures on a model shape with and without a boattail are reported. The model shape is similar to the M549 external geometry. Data were obtained at M = 0.908 at 10 longitudinal positions along the model. Measurements were made at 0, 1, 2.5, and 5.0 degrees angle of attack and at circumferential positions around the model in 10 degree increments. GRA

N81-25046# United Technologies Research Center, East Hartford, Conn.

ANALYSIS OF LAMINAR AND TURBULENT SYMMETRIC BLUNT TRAILING-EDGE FLOWS Final Report, 13 Dec. 1979 - 13 Jan. 1981

V. N. Vatsa, M. J. Werle, and J. M. Verdon Apr. 1981 75 p refs
(Contract N00019-80-C-0057)
(AD-A098703; UTRC/R81-914986-5) Avail: NTIS HC A04/MF A01 CSCL 20/4

Contributions are made to interacting viscous flow theory for symmetric separated flow past blunt airfoil trailing edges. A theoretical and computational technique for predicting turbulent, high Reynolds number, separation and near wake flow is provided. A detailed assessment of a viscous/inviscid iteration and an

inverse boundary layer solution procedure is provided through a systematic series of test examples. These involve subsonic laminar and turbulent flows past flat plate and thickened flat plate (blunt trailing-edged) airfoils. In addition, a general approach is outlined for incorporating local strong interaction solutions into an overall viscous solution procedure for isolated airfoils and cascades. Author (GRA)

N81-25047# Air Cruisers Co., Belmar, N.J.
DEVELOPMENT OF RETARDATION AND AUTOMATIC FLOTATION SYSTEM (R.A.F.T.) Final Report, Feb. 1976 - Jul. 1980
Donald R. Hermann and Ralph A. Miller 7 Jul. 1980 133 p refs
(Contract N62269-76-C-0293; WF60532000)
(AD-A096828; NADC-75353-60; EDN-984) Avail: NTIS HC A07/MF A01 CSCL 01/2

Design, fabrication, and initial evolution testing of prototype retardation and automatic flotation systems (RAFT) are discussed. The RAFT system is used during helicopter transfer of sensitive cargo during VERTREP operations. Design concept is based on an integrated parachute/flotation body. Overall system weight is 164 lbs. and packed volume is 4.3 cu ft. GRA

N81-25048# New York Univ., N. Y. Mathematics and Computing Lab.
UNSTEADY TRANSONIC FLOW PAST AIRFOILS IN RIGID-BODY MOTION
I-Chung Chang Mar. 1981 202 p refs
(Contract DE-AC02-76ER-03077)
(DOE/ER-03077/170) Avail: NTIS HC A10/MF A01

Basic concepts in computational transonics to develop a fast and accurate computer code to predict the aerodynamics forces needed for a flutter analysis, are reviewed. The unsteady transonic flow past airfoils in rigid body motion is described by the potential flow equation as long as the boundary layer remains attached. The two dimensional unsteady transonic potential flow equation in quasilinear form with first order radiation boundary conditions is solved by an alternating direction implicit scheme in an airfoil attached sheared parabolic coordinate system. It is shown that the scheme is very stable and can resolve the higher nonlinear transonic effects for filter analysis within the context of an inviscid theory. DOE

N81-26009# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
NUMERICAL COMPUTATION OF THREE DIMENSIONAL TRANSONIC INTERNAL FLOWS
Jacques Brochet *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-5 (ESA-TT-673) Mar. 1981 p 3-18 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-5, Sep. - Oct. 1980 p 301-315 (For primary document see N81-26008 16-99)
Avail: NTIS HC A05/MF A01

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

N81-25049# Committee on Government Operations (U. S. House).
AVIATION SAFETY: HAZARDOUS MATERIALS HANDLING
Washington GPO 1980 152 p refs Hearing before a Subcomm. of the Comm. on Govt. Operations, 96th Congr., 2nd Sess., 16 Aug. 1980
(GPO-89-199) Avail: Committee on Government Operations

The handling of hazardous materials, specifically the carriage of hazardous materials by air is addressed. Procedures employed at airports when handling such materials are examined in relation to the contact exposure risk to airport personnel, flightcrews, flight attendants, cargo handlers, and postal employees. J.M.S.

N81-25050*# Douglas Aircraft Co., Inc., Long Beach, Calif.
TESTING OF AIRCRAFT PASSENGER SEAT CUSHION MATERIAL, FULL SCALE. DATA, VOLUME 2 Final Report, Apr. 1980 - Mar. 1981
Kenneth J. Schutter, James G. Gaume, and Fred E. Duskin Nov. 1980 340 p
(Contract NAS9-16062)
(NASA-CR-160963; MDC-J4673-Vol-2) Avail: NTIS HC A15/MF A01 CSCL 13L

Burn characteristics of presently used and proposed seat cushion materials and types of constructions were determined. Eight different seat cushion configurations were subjected to full scale burn tests. Each cushion configuration was tested twice for a total of 16 tests. Two different fire sources were used: Jet A-fuel for eight tests, and a radiant energy source with propane flame for eight tests. Data were recorded for smoke density, cushion temperatures, radiant heat flux, animal response to combustion products, rate of weight loss of test specimens, cabin temperature, and type and content of gas within the cabin. When compared to existing seat cushions, the test specimens incorporating a fire barrier and those fabricated from advanced materials, using improved construction methods, exhibited significantly greater fire resistance. Flamability comparison tests were conducted upon one fire blocking configuration and one polyimide configuration. E.A.K.

N81-25051*# Douglas Aircraft Co., Inc., Long Beach, Calif.
TESTING OF AIRCRAFT PASSENGER SEAT CUSHION MATERIALS. FULL SCALE, TEST DESCRIPTION AND RESULTS, VOLUME 1 Final Report, 11 Mar. 1980 - 10 May 1981
Kenneth J. Schutter, James G. Gaume, and Fred E. Duskin Feb. 1981 109 p refs
(Contract NAS9-16062)
(NASA-CR-160995-Vol-1) Avail: NTIS HC A06/MF A01 CSCL 01C

Eight different seat cushion configurations were subjected to full-scale burn tests. Each cushion configuration was tested twice for a total of sixteen tests. Two different fire sources were used. They consisted of one liter of Jet A fuel for eight tests and a radiant energy source with propane flame for eight tests. Both fire sources were ignited by a propane flame. During each test, data were recorded for smoke density, cushion temperatures, radiant heat flux, animal response to combustion products, rate of weight loss of test specimens, cabin temperature, and for the type and content of gas within the cabin atmosphere. When compared to existing passenger aircraft seat cushions, the test specimens incorporating a fire barrier and those fabricated from advanced materials, using improved construction methods, exhibited significantly greater fire resistance. DOE

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N81-25052# Analytic Sciences Corp., Reading, Mass.
OMEGA SIGNAL COVERAGE PREDICTION DIAGRAMS FOR 10.2 kHz, VOLUME 3 Final Report, Sep. 1979 - Oct. 1980
Radha R. Gupta, Stephen F. Donnelly, Paul M. Creamer, and Suzanne Sayer Oct. 1980 56 p
(Contract DOT-CG-951480-A)
(AD-A092742; TASC-TR-3077-2-Vol-3) Avail: NTIS HC A04/MF A01 CSCL 17/7

Forty-eight composite coverage diagrams are presented which

embody eight coverage times, two signal access criteria, and three different projections (North and South Pole centered Azimuthal Equal Distance, and Mercator). Each diagram displays the global accessibility of usable signals from the system for a designated signal access criterion and coverage time. T.M.

N81-25053# Army Aviation Research and Development Command, St. Louis, Mo.
THE DEVELOPMENT AND TESTING OF THE NAVSTAR GLOBAL POSITIONING SYSTEM/DOPPLER RADAR VELOCITY SENSOR HEADING REFERENCE SYSTEM (GDHED)
Jack Gray Feb. 1981 152 p refs
(AD-A096421; AVRADCOM-TR-80-E-3) Avail: NTIS HC A08/MF A01 CSCL 17/7

The system was developed and field tested in a van for evaluation of performance. Earth-referenced velocities derived from the GPS set and body referenced velocities derived from the AN/ASN-128 Doppler Set were combined in a separate HYBRID computer to determine true vehicle heading. The results of these tests successfully demonstrated that a new method of providing non-magnetic, non-gyrocompass vehicle heading is possible.T.M.

N81-25054# Synectics Corp., Fairfax, Va.
AUTOMATED AIR INFORMATION PRODUCTION SYSTEM, PHASE 2 Final Technical Report, Jul. 1978 - Aug. 1980
R. Patrick OConnor and Nicholas A. Bottini Griffiss AFB, N.Y. RADC Oct. 1980 132 p refs
(Contract F30602-77-C-0065; AF Proj. 621H; AF Proj. 9137) (AD-A096436; RADC-TR-80-323) Avail: NTIS HC A07/MF A01 CSCL 09/2

The requirements, functional design and operational considerations of the AAIPS Charting, Air Facilities, and Publishing Subsystem are presented. The principal purpose of the three subsystems is the reduction of the labor (manual) required for the revision and republication of information critical to flight operations and logistical planning. Improvement of response time between receipt of changes to air navigation/air facilities data and the dissemination of new data to all users, is also provided. The Publishing Subsystem permits publications to be produced on electronic equipment and extends the power and flexibility of digital manipulation to the updating and reformatting of publications. T.M.

N81-25055# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
AN ANALYTICAL SOLUTION OF THE TWO STAR SIGHT PROBLEM OF CELESTIAL NAVIGATION Progress Report
James A. VanAllen Feb. 1981 17 p refs
(Contract N00014-76-C-0016)
(AD-A098626; U-of-Iowa-81-2) Avail: NTIS HC A02/MF A01 CSCL 17/7

The classical problem of celestial navigation, in its simplest form, is the determination of an observer's longitude and latitude from the altitudes of two identified stars, observed at a known Greenwich Mean Time on a known date. A novel solution of this problem in closed analytical form is given herein. The solution yields the two possible positions of the observer without any prior knowledge of his position, without any dependence on tables of computed altitudes and azimuths for an assumed position, and without any graphical work. The basic two-fold ambiguity is resolved to yield a single, unique position by repeating the calculation using the altitudes of a third star and of one of the two previous stars. The full analytical solution is given as are some artificial numerical examples, readily performed on a hand-held, programmable calculator. Author (GRA)

N81-25056# Mitre Corp., McLean, Va.
CONSOLIDATED CAB DISPLAY (CCD) SYSTEM, PROJECT PLANNING DOCUMENT (PPD)
Al Asch and L. Wuebker Feb. 1981 79 p refs
(Contract DOT-FA01-81-C-10001)
(AD-A098651; MTR-81W49; FAA-RD-81-6) Avail: NTIS HC A05/MF A01 CSCL 17/2

This report provides the planning guidance for the development, installation, testing and evaluation for the Consolidated Cab Display (CCD) System. The Federal Aviation Administration (FAA) is acquiring two systems for engineering tests and operational evaluations to determine system reliability and design acceptability to Air Traffic Control Tower (ATCT) and Terminal Radar Control (TRACON) controllers. One system will be installed at the FAA Technical Center for engineering and operational evaluations, and a second one at the Atlanta ATCT/TRACON for operational evaluations. The evaluations will provide the FAA with information for making decisions and developing programs for future automation support to the ATCT/TRACON air traffic control specialists. Author (GRA)

N81-25057# Transportation Systems Center, Cambridge, Mass.
BENEFITS AND COSTS OF LORAN-C EXPANSION INTO THE EASTERN CARIBBEAN Final Report, Oct. 1979 - Jun. 1980
Robert D. Reymond Jan. 1981 324 p refs
(AD-A098582; TSC-USCG-81-1; USCG-NRN-1-81) Avail: NTIS HC A14/MF A01 CSCL 17/7

This study assesses the benefits and costs to the marine community of various LORAN-C alternatives for possible expansion into the Eastern Caribbean. Also considered, but at a lesser level of detail, is the application of differential omega as an additional alternative. Included are projections through the year 2000 for user and government costs and benefits, user populations, and traffic flows are trade patterns. User populations are defined in terms of large and small commercial vessels, fishing and commercial sport fishing vessels, and pleasure craft. Trade and traffic flows are characterized by principal commodity, vessel type, origin and destination and vessel routing. Measures of comparative system value include benefit/cost ratios, benefits and costs generated per vessel, and benefits and costs per square mile of signal coverage. Also included are case studies of marine groundings in the Caribbean, studies of current and future directions of the Puerto Rico-Virgin Islands fishing industry and future trends for recreational boating in the region.Author (GRA)

N81-25058# Bendix Corp., Baltimore, Md. Communications Div.
TACTICAL MINIATURE CRYSTAL OSCILLATOR Semiannual Report, 1 Oct. 1979 - 1 Apr. 1980
D. Brown and P. Stoermer Mar. 1981 61 p refs
(Contract DAAB07-78-C-2990; DA Proj. 1L1-62705-AH-94) (AD-A098490; DELET-TR-78-2990-3) Avail: NTIS HC A04/MF A01 CSCL 17/7

This report describes the advanced development of a fast warmup tactical Miniature Crystal Oscillator (TMXO). The intended use of this TMXO is as a precision frequency/time reference in advanced communications, navigation and position location systems. The present effort is a continuation of work based on the demonstrated feasibility on previous contracts. This interim report describes work performed in evaluation of various aspects of crystals performance, and the contribution of components on oscillator long term stability. Mechanically, progress is described in material selection, process evolution and thermal analysis. Author (GRA)

N81-25059# Federal Aviation Administration, Atlantic City, N.J.
AIRPORT SURFACE DETECTION EQUIPMENT (ASDE)-3 OPERATIONAL EVALUATION Final Report, 14 Apr. - 30 May 1980
Louis A. Dvorsky, Anthony J. Swezeny, and Edwin R. Hartz Mar. 1981 37 p
(FAA Proj. 143-102-540)
(AD-A098480; FAA-CT-81-6; FAA-RD-81-2) Avail: NTIS HC A03/MF A01 CSCL 17/7

Operational tests were performed on the Airport Surface Detection Equipment (ASDE)-3 radar. Three teams of air traffic controllers, two per team, with current field ASDE-2 experience, were used as test subjects. The controllers were from the Eastern and New England Regions. These tests were conducted to determine the extent to which the ASDE-3 met requirements as presented by the Air Traffic Service and what the controllers: opinions were of the radar. Tests conducted were: airport surface coverage, capability, target detection as a function of speed between aircraft and aircraft to obstruction resolution, target size and shape determination, standing target heading, and runway clearance. Author (GRA)

N81-25060# Federal Aviation Administration, Atlantic City, N.J.
NEW TOWER CAB MOCKUP FOR PHILADELPHIA, PENNSYLVANIA Final Report, Jun. - Oct. 1980
Donald Bottomley, Edward G. Ezekiel, and Rene Matos Mar. 1981 17 p
(AD-A098528; FAA-CT-81-12; FAA-RD-80-141) Avail: NTIS HC A02/MF A01 CSCL 17/7

Mockup techniques which used foamcore and plywood were employed by the Federal Aviation Administration (FAA) Technical Center to achieve two major goals in assisting the Regional Office and the Air Traffic Control Facility to establish a new control tower at Philadelphia, Pennsylvania. Goal one was to determine the best physical location of present and planned equipment for operational positions and to suggest innovations which would improve their functional capability. Goal two was to design, develop, fabricate, and evaluate the central interior console which is not common to most tower cabs and is not a standard configuration. The result of this effort was a more functional and efficient layout for a standard 525 square foot Welton-Beckett tower cab. Several new modules were introduced to the peripheral consoles, and a unique central console was designed. A new, innovative technique was created to house the bright radar indicator tower equipment (BRITE) displays on swivel, console-height mounts. Author (GRA)

N81-25061# Ohio Univ., Athens. Dept. of Electrical Engineering.
VLF P-STATIC NOISE REDUCTION IN AIRCRAFT. VOLUME 1: CURRENT KNOWLEDGE Final Report, May 1979 - Aug. 1980
Robert W. Lilley and Ralph W. Burhans Sep. 1980 102 p refs
(Contract DOT-FA79WA-4302)
(AD-A098451; EER-48-1; FAA-RD-80-137-1) Avail: NTIS HC A06/MF A01 CSCL 17/7

In Volume 1, the results of a literature search and facilities/capabilities survey to determine existing and LF p-static knowledge and noise-reduction techniques are presented. References treating basic p-static and corona theory, airframe quieting techniques and instrumentation methods are abstracted. A description of the Ohio University research aircraft installation for discharge current and static field environment is given. Brief reference is made to lightning interference. Lighting discharges, although not p-static, are considered sources of Loran-C interference which should be characterized more specifically. Volume 2 will present recommendations for further study and experimentation to permit better understanding of Loran-C interference processes, and procedures and techniques for minimizing their effects. Author (GRA)

N81-25062# National Telecommunications and Information Administration, Boulder, Colo.
EVALUATION OF DISCRETE ADDRESS BEACON SYSTEM (DABS) EMC
Robert M. Pratt and Jay S. Levy Nov. 1980 41 p refs
(Contract DOT-FA01-80-Y-10535)
(PB81-154387; NTIA/Rept-80-53) Avail: NTIS HC A03/MF A01 CSCL 17G

Questions were raised regarding the Electromagnetic Compatibility (EMC) of DABS because of common channel usage with the Air Traffic Control Radar Beacon System. The EMC of DABS with operational and firmly planned systems in the 960-1215 MHz band was investigated. This was accomplished by evaluating FAA theoretical calculation, measurement, and simulation results, and performing an independent analysis through theoretical calculations and computer simulations. GRA

N81-25063# Gould Information Identification, Inc., Fort Worth, Tex.
LORAN-C RFI MEASURED IN LOS ANGELES, CALIFORNIA Final Report, Dec. 1978 - Jan. 1979
W. R. Vincent and G. Sage Oct. 1980 238 p refs Prepared in cooperation with Systems Control, Inc., Palo Alto, Calif.
(Contract DOT-TSC-1237)
(PB81-151300; DOT-TSC-UMTA-80-38; UMTA-MA-06-0041-80-1) Avail: NTIS HC A11/MF A01 CSCL 17G

Emphasis was placed on the definition of the detailed time and frequency domain structure of noise and RFI which might degrade the reception of Loran-C signals in urban, suburban, and industrial areas of Los Angeles. The measurements were directed toward obtaining an understanding of the noise and RFI environment which would be encountered by vehicularly installed Loran-C navigation systems. Measurements were made at and around the 100 kHz band of frequencies employed by Loran-C, and they were made from a mobile van. The noise and RFI instrumentation is described. GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.
For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N81-25064*# Grumman Aerospace Corp., Bethpage, N.Y.
AXISYMMETRIC & NON-AXISYMMETRIC EXHAUST JET INDUCED-EFFECTS ON A V/STOL VEHICLE DESIGN. PART 1: DATA PRESENTATION Interim Report
W. C. Schnell and G. W. Ordonez 1 May 1981 538 p refs
(Contract NAS2-9887)
(NASA-CR-166146; Rept-0747-81-Pt-1) Avail: NTIS HC A23/MF A01 CSCL 01C

A 1/8 scale jet-effects model was tested in the NASA Ames 11 ft transonic tunnel at static conditions and over a range of Mach numbers from 0.4 to 1.4. The data presented show that significant differences in aeropropulsion performance can be expected by varying the exhaust nozzle type and its geometric parameters on a V/STOL underwing nacelle installation. T.M.

N81-25065*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EVALUATION OF A PNEUMATIC BOOT DEICING SYSTEM ON A GENERAL AVIATION WING MODEL
Alan E. Albright (Kansas Univ., Lawrence), David L. Kohlman (Kansas Univ., Lawrence), William G. Schweikhard (Kansas Univ., Lawrence), and Peggy Evanich Jun. 1981 35 p refs
(Grant NAS3-71)
(NASA-TM-82363; KU-FRL-464-2) Avail: NTIS HC A03/MF A01 CSCL 01C

The aerodynamic characteristics of a typical modern general aviation airfoil were investigated with and without a pneumatic boot ice protection system. The ice protection effectiveness of the boot was studied. This includes the change in drag on the airfoil with the boot inflated and deflated, the change in drag due to primary and residual ice formation, drag change due to cumulative residual ice formation, and parameters affecting boot effectiveness. Boot performance was not affected by tunnel total temperature or velocity. Marginal effect in performance was associated with angle of attack. Significant effects on performance were caused by variations in droplet size, LWC, ice cap thickness inflation pressure, and surface treatment. T.M.

N81-25066*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
APPLICATION OF A FLIGHT TEST AND DATA ANALYSIS TECHNIQUE TO FLUTTER OF A DRONE AIRCRAFT
Robert M. Bennett May 1981 12 p refs
(NASA-TM-83136) Avail: NTIS HC A02/MF A01 CSCL 01C

Modal identification results presented were obtained from recent flight flutter tests of a drone vehicle with a research wing (DAST ARW-1 for Drones for Aerodynamic and Structural Testing, Aeroelastic Research Wing-1). This vehicle is equipped with an active flutter suppression system (FSS). Frequency and damping of several modes are determined by a time domain modal analysis of the impulse response function obtained by Fourier transformations of data from fast swept sine wave excitation by the FSS control surface on the wing. Flutter points are determined for two different altitudes with the FSS off. Data are given for near the flutter boundary with the FSS on. Author

N81-25067*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RESEARCH RELATED TO VARIABLE SWEEP AIRCRAFT DEVELOPMENT
Edward C. Polhamus and Thomas A. Toll May 1981 42 p refs Presented at the Meeting of the Air Force Historical Foundation, Hampton, Va., 27 Mar. 1981
(NASA-TM-83121) Avail: NTIS HC A03/MF A01 CSCL 01C

Development in high speed, variable sweep aircraft research is reviewed. The 1946 Langley wind tunnel studies related to variable oblique and variable sweep wings and results from the X-5 and the XF10F variable sweep aircraft are discussed. A joint program with the British, evaluation of the British 'Swallow', development of the outboard pivot wing/aft tail configuration concept by Langley, and the applied research program that followed and which provided the technology for the current, variable sweep military aircraft is outlined. The relative state of variable sweep as a design option is also covered. E.A.K.

N81-25068# Aeronautical Consultant Associates, Rancho Palos Verdes, Calif.
APPLICATION OF THE JOINED WING TO CRUISE MISSILES Final Report, Phase 1
Julian Wolkovitch Nov. 1980 201 p refs
(Contract N00014-79-C-0953)
(AD-A096450; ONR-CR-212-266-1) Avail: NTIS HC A10/MF A01 CSCL 16/4

The joined wing is an airplane and missile configuration comprising two wings, a fuselage, and a fin, arranged such that the wings form diamond shapes both in plan view and in front view. Advantages for the joined wing include lightness, stiffness, low induced drag, low wave drag, high trimmed maximum lift coefficient, reduced parasite drag, and good stability and control, plus built-in direct lift and sideforce capabilities. Comparisons were made of three cruise missile configurations: conventional, joined wing, and joined wing plus canard. The latter configurations yield large advantages in range, maneuverability, and terrain-following. Optimal control theory was employed to calculate the terrain-following accuracy of each configuration. T.M.

N81-25069# Kuhn (Richard E.), Newport News, Va.
AN ENGINEERING METHOD FOR ESTIMATING THE INDUCED LIFT ON V/STOL AIRCRAFT HOVERING IN AND OUT OF GROUND EFFECT Final Technical Report
Richard E. Khun Jan. 1981 105 p refs
(Contract N62269-80-C-0366; WF41400)
(AD-A098509; NADC-80246-60) Avail: NTIS HC A06/MF A01 CSCL 20/4

An examination and correlation of available data has shown that two different methods must be used to estimate the jet induced lift on fan and jet V/STOL aircraft in hovering flight. The basic method developed in this study is used for configurations with widely spaced jets, and the h' Method is used for configurations with closely spaced jets. The methods account for the effects of jet arrangement, configuration planform, wing height, body contour and Lift Improvement Devices (LIDs) but are limited to configurations with essentially vertical, circular jets of equal size and thrust. Suggestions for further work to evaluate and refine the methods are included. Author (GRA)

N81-25070# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
VIBRATION TEST LEVEL CRITERIA FOR AIRCRAFT EQUIPMENT Final Report, 6 Nov. 1978 - 30 Sep. 1979
Preston S. Hall Dec. 1980 31 p refs
(AF Proj. 2402)
(AD-A098675; AFWAL-TR-80-3119) Avail: NTIS HC A03/MF A01 CSCL 14/2

This study details inhouse efforts that recommend vibration test level criteria for reliability of aircraft equipment. The study assesses the impact of current vibration test level criteria on the resultant reliability statistics of aircraft equipment. Problems of profiling mission vibration environmental stresses as compared to other environmental stresses are analyzed. An analysis of the readily available tools to determine the vibration stresses is also conducted. A comparison is made of various vibration exposure times and levels for a number of equipment under multiple tests. The resulting reliability under the multiple tests is compared to field reliability data for the equipment studied. Author (GRA)

N81-26010# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
PRESSURE DISTRIBUTION COMPUTATION ON A NON-LIFTING SYMMETRICAL HELICOPTER BLADE IN FORWARD FLIGHT
Jean-Jacques Chattot and Jean-Jacques Philippe *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-5 (ESA-TT-673) Mar. 1981 p 19-33 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-5, Sep. - Oct. 1980 p 317-330 (For primary document see N81-26008 16-99)
Avail: NTIS HC A05/MF A01

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N81-25071# Army Aeromedical Research Lab., Fort Rucker, Ala. Biodynamics Research Div.
VIBRATION IN A HELMET MOUNTED SIGHT (HMS) USING MECHANICAL LINKAGE Final Report
John C. Johnson, David B. Priser, and Robert W. Verona Mar. 1981 31 p refs
(DA Proj. 3E1-62777-A-878)
(AD-A098533; USAARL-81-3) Avail: NTIS HC A03/MF A01 CSCL 05/5

Two variations of the SPH-4 flight helmet were tested: (1) SPH-4 with standard web suspension, (2) SPH-4 with a form-fit foam liner suspension. The system was tested in the front seat of an AH-1S 'Cobra' helicopter. Five flight conditions were used in the experiment: (1) hover, (2) 40 kn, (3) 80kn, (4) 120kn, (5) standard left turn. Two conditions of the helmet mounted control linkage were tested: (1) connected, (2) disconnected. A triaxial accelerometer was mounted on top of the flight helmet to measure vibration. The following observations were made: (1) Both helmets vibrate more with the sight attached. (2) The response to the sight coupled vibration of the standard SPH-4 differed from that of the form-fit SPH-4. (3) The form-fit SPH-4 helmet vibrated more in a narrow band centered at about 30 Hz. (4) The standard SPH-4 helmet vibrated more over a wide band of frequencies above 30Hz. Concluded that the significant increase in vibration of the helmet caused by the mechanical sight linkage may be expected to degrade pilot/gunner visual performance and hearing acuity, and increase fatigue rate to some extent. GRA

N81-25072# United Technologies Corp., Windsor Locks, Conn.
REQUIREMENTS, TECHNOLOGY AND CONFIGURATION EVALUATION FOR CRASH SURVIVABLE FLIGHT DATA RECORDING (CSFDR) SYSTEM Final Report, 23 Jul. 1980 - 13 Feb. 1981
Henry R. Ask, James A. Herdon, and Donald L. White 11 Apr. 1981 222 p refs
(Contract F33615-80-E-0134)
(AD-A098584; ESP-8111; ASD-TR-81-5010) Avail: NTIS HC A10/MF A01 CSCL 01/4

The objective of this effort was to determine the requirements, configuration and cost for a standard Crash Survivable Flight Data Recorder (CSFDR) for fighter, attack and trainer aircraft. An additional objective was the determination of broader usage of a standard configuration for the tri-services along with expansion of the system to include maintenance monitoring functions. Author (GRA)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N81-25073# AiResearch Mfg. Co., Phoenix, Ariz.
COOLED, LAMINATED RADIAL TURBINE DEMONSTRATION PROGRAM Final Report
R. W. Vershure, Jr., G. D. Large, L. J. Meyer, and M. J. Egan Feb. 1981 216 p refs
(Contract DAAJ02-77-C-0032; DA Proj. 1L2-62209-AH-76)
(AD-A098120; AVRADCOM-TR-81-D-7; Rept-21-3684) Avail: NTIS HC A10/MF A01 CSCL 21/5

A low-cost, high-temperature radial turbine has been developed that demonstrates the technology required to manufacture a small, cooled turbine using photoetched laminates bonded together to form a complete wheel. An advanced long-life and high-performance turbine design is described which uses an iterative optimization procedure to provide a balanced mechanical and aerodynamic design. The calculated bulk heat-transfer effectiveness was 0.54 with operation at 2300 F over a typical Army helicopter mission of 6000 cycles and with a design life of 5000 hours. Several wheels were manufactured from precision-rolled Astrology sheet. The mechanical integrity was demonstrated in a series of proof tests conducted in a whirlpit test facility including overspeed, growth, and burst tests, a stresscoat test, and a 6000-cycle test at overspeed conditions (119-percent design speed) to establish the low-cycle-fatigue characteristics of this rotor. Author (GRA)

N81-25074*# General Electric Co., Cincinnati, Ohio.
DESIGN OF A V/STOL PROPULSION SYSTEM FOR A LARGE-SCALE FIGHTER MODEL Final Report
W. S. Willis May 1981 58 p refs
(Contract NAS2-10556)
(NASA-CR-166162; R81AEG257) Avail: NTIS HC A04/MF A01 CSCL 21E

Modifications were made to the existing Large-Scale STOL fighter model to simulate a V/STOL configuration. Modifications include the substitutions of two dimensional lift/cruise exhaust nozzles in the nacelles, and the addition of a third J97 engine in the fuselage to suppy a remote exhaust nozzle simulating a Remote Augmented Lift System. A preliminary design of the inlet and exhaust ducting for the third engine was developed and a detailed design was completed of the hot exhaust ducting and remote nozzle. Author

N81-25075*# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.
SEMI-ACTUATOR DISK THEORY FOR COMPRESSOR CHOKE FLUTTER Final Report
J. Micklow and J. Jeffers Washington NASA Jun. 1981 169 p refs
(Contract NAS3-20060)
(NASA-CR-3426; FR-12976) Avail: NTIS HC A08/MF A01 CSCL 21E

A mathematical anaysis predict the unsteady aerodynamic utilizing semi actuator theory environment for a cascade of airfoils harmonically oscillating in choked flow was developed. A normal shock is located in the blade passage, its position depending on the time dependent geometry, and pressure perturbations of the system. In addition to shock dynamics, the model includes the effect of compressibility, interblade phase lag, and an unsteady flow field upstream and downstream of the cascade. Calculated unsteady aerodynamics were compared with isolated airfoil wind tunnel data, and choke flutter onset boundaries were compared with data from testing of an F100 high pressure compressor stage. E.A.K.

N81-25076*# TRW, Inc., Cleveland, Ohio.
FABRICATION PROCESS DEVELOPMENT OF BORON/ALUMINUM FAN BLADES FOR HIGH BYPASS ENGINES Final Report, Jun. 1976 - Sep. 1979
Gordon S. Doble Feb. 1981 43 p refs
(Contract NAS3-20115)
(NASA-CR-165252; ER-8174-F) Avail: Issuing Activity CSCL 21E

Preliminary design effects were performed to establish design features for a boron-aluminum first stage CF-6 fan blade satisfactory for meeting engine aeromechanical and small bird FOD resistance requirement. Tooling for the blade was designed, constructed, and checked out by fabrication of a laminated aluminum CF-6 blade. Rapid air bonding was successfully employed to produce sound matrix bonds in a second CF-6 B/A1 blade. T.M.

N81-25077*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.
ENERGY EFFICIENT ENGINE, LOW-PRESSURE TURBINE BOUNDARY LAYER PROGRAM
W. B. Gardner Apr. 1981 62 p refs
(Contract NAS3-20646)
(NASA-CR-165338; PWA-5594-141) Avail: NTIS HC A04/MF A01 CSCL 21E

A study was conducted to investigate development of boundary layers under the influence of velocity distributions simulating the suction side of two state-of-the-art turbine airfoils: a forward loaded airfoil (squared-off design) and an aft loaded airfoil (aft-loaded design). These velocity distributions were simulated in a boundary layer wind tunnel. Detailed measurements of boundary layer mean velocity and turbulence intensity profiles were obtained for an inlet turbulence level of 2.4 percent and an exit Reynolds number of 800,000. Flush-mounted hot film probes identified the boundary layer transition regimes in the adverse pressure gradient regions for both velocity distributions. Wall intermittency data showed good agreement with the correlations of Dhawan and Narasimha for the intermittency factor distribution in transitional flow regimes. T.M.

N81-25078*# General Electric Co., Lynn, Mass. Aircraft Engine Group.
PROPULSION SYSTEM STUDY FOR SMALL TRANSPORT AIRCRAFT TECHNOLOGY (STAT) Final Report
C. E. Smith, R. Hirschkron, and R. E. Warren May 1981 216 p refs
(Contract NAS3-21996)
(NASA-CR-165330; R80AEG068) Avail: NTIS HC A10/MF A01 CSCL 21A

Propulsion system technologies applicable to the generation of commuter airline aircraft expected to enter service in the 1990's are identified and evaluated in terms of their impact on aircraft operating economics and fuel consumption. The most promising technologies in the areas of engine, propeller, gearbox, and nacelle design are recommended for future research. Each item under consideration is evaluated relative to a modern baseline engine, the General Electric CT7-5, in a current technology aircraft flying a fixed range and payload. The analysis is presented for two aircraft sizes (30 and 50 passenger), over a range of mission lengths (100 to 1100 km) and fuel costs ($264 to $396 per cu m). T.M.

N81-25079*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPARISON OF NASA AND CONTRACTOR RESULTS FROM AEROACOUSTIC TESTS OF QCSEE OTW ENGINE
H. E. Bloomer, I. J. Loeffler, W. J. Kreim, and J. W. Coats Apr. 1981 27 p refs
(NASA-TM-81761; E-824) Avail: NTIS HC A03/MF A01 CSCL 21E

The aerodynamics and acoustics of the over-the-wing (OTW) Quiet, Clean, Short Haul Experimental Engine (QCSEE) were tested. A boilerplate (nonflight weight), high-throat Mach number, acoustically treated inlet and a D-shaped OTW exhaust nozzle with variable position side doors were used. Some acoustic directivity results for the type 'D' nozzle and acoustic effects of variations in the nozzle side door positions are included. It was found that the results are in agreement with those previously obtained. E.A.K.

N81-25080*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

MEASUREMENT OF AERODYNAMIC WORK DURING FAN FLUTTER

A. P. Kurkov 1981 16 p refs Proposed for presentation at the 1981 Winter Ann. Meeting of the ASME, Washington, D.C., 15-20 Nov. 1981

(NASA-TM-82652; E-911) Avail: NTIS HC A02/MF A01 CSCL 21E

Stationary high response pressure and displacement measurements are used to describe the flutter characteristics of the first fan rotor of a turbofan engine. Flutter occurred at part speed and at high incidence. Several forward and backward traveling waves were identified in a predominantly torsional flutter mode. Positive aerodynamic work contribution was confined to the region close to the leading edge and was mainly due to modes corresponding to forward traveling waves of nodal diameters in the range 3 to 5. Author

N81-25081*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECT OF A PART-SPAN VARIABLE INLET GUIDE VANE ON THE PERFORMANCE OF A HIGH-BYPASS TURBOFAN ENGINE

George A. Bobula (AVRADCOM Research and Technology Labs., Cleveland), Ronald H. Soeder, and Leo A. Burkardt 1981 15 p refs Proposed for presentation at the 17th Joint Propulsion Conf., Colorado Springs, 27-29 Jul. 1981; sponsored by AIAA, ASME, and SAE

(NASA-TM-82617; E-869; AVRADCOM-TR-81-C-10) Avail: NTIS HC A02/MF A01 CSCL 21E

The ability of a part span variable inlet guide vane (VIGV) to modulate the thrust of a high bypass turbofan engine was evaluated at altitude/Mach number conditions of 4572 m/0.6 and 9144 m/0.93. Fan tip, gas generator and supercharger performance were also determined, both on operating lines and during fan duct throttling. The evaluation was repeated with the bypass splitter extended forward to near the fan blade trailing edge. Gross thrust attentuation of over 50 percent was achieved with 50 degree VIGV closure at 100 percent corrected fan speed. Gas generator supercharger performance fell off with VIGV closure, but this loss was reduced when a splitter extension was added. The effect of VIVG closure on gas generator performance was minimal. Author

N81-25082*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

JT9D PERFORMANCE DETERIORATION RESULTS FROM A SIMULATED AERODYNAMIC LOAD TEST

Edward G. Stakolich and William J. Stromberg (Pratt and Whitney Aircraft, East Hartford, Conn.) 1981 21 p refs Proposed for presentation at the 17th Joint Propulsion Conf., Colorado Springs, 27-29 Jul. 1981; sponsored by AIAA, SAE, and ASME

(NASA-TM-82640; E-895) Avail: NTIS HC A02/MF A01 CSCL 21E

The results of testing to identify the effects of simulated aerodynamic flight loads on JT9D engine performance are presented. The test results were also used to refine previous analytical studies on the impact of aerodynamic flight loads on performance losses. To accomplish these objectives, a JT9D-7AH engine was assembled with average production clearances and new seals as well as extensive instrumentation to monitor engine performance, case temperatures, and blade tip clearance changes. A special loading device was designed and constructed to permit application of known moments and shear forces to the engine by the use of cables placed around the flight inlet. The test was conducted in the Pratt & Whitney Aircraft X-Ray Test Facility to permit the use of X-ray techniques in conjunction with laser blade tip proximity probes to monitor important engine clearance changes. Upon completion of the test program, the test engine was disassembled, and the condition of gas path parts and final clearances were documented. The test results indicate that the engine lost 1.1 percent in thrust specific fuel consumption (TSFC), as measured under sea level static conditions, due to increased operating clearances caused by simulated flight loads. This compares with 0.9 percent predicted by the analytical model and previous study efforts. Author

N81-25083*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SELECTED RESULTS FROM COMBUSTION RESEARCH AT THE LEWIS RESEARCH CENTER

Robert E. Jones 1981 13 p refs Proposed for presentation at the 17th Joint Propulsion Conf., Colorado Springs, 27-29 Jul. 1981; sponsored by AIAA, SAE, and ASME

(NASA-TM-82627; E-880) Avail: NTIS HC A02/MF A01 CSCL 21E

Combustion research at Lewis is organized to provide a balanced program responsive to national needs and the gas turbine industry. The results of this research is a technology base that assists the gas turbine engine manufacturers in developing new and improved combustion systems for advanced civil and military engines with significant improvements in performance, durability, fuel flexibility and control of exhaust emissions. Research efforts consist of fundamentals and modeling, and applied component and combustor research. T.M.

N81-25084*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

HIGH-RESPONSE MEASUREMENTS OF A TURBOFAN ENGINE DURING NONRECOVERABLE STALL

Doug Lee Apr. 1981 27 p refs

(NASA-TM-81759; E-822) Avail: NTIS HC A03/MF A01 CSCL 21E

High response measurements of a Pratt and Whitney F100(3) turbofan engine at a simulated Mach number and altitude of 1.2 and 3000 m (10,000 ft) respectively were recorded during a nonrecoverable stall. The nonrecoverable stall occurred as a result of incorrect scheduling of the high compressor variable vanes (RCVV) during an experimental engine control investigation. Recorded data indicates rotating stall originating in the high pressure compressor. From this region the disturbance propagates upstream into the fan, and downstream throughout the core compressor. The rotating stall remained in the core compressor until the engine was shutdown. The fan exhibited some rotating stall, but the amplitude of the pressure oscillations were less severe. Data indicates that the fan was able to recover from the stall. Fan turbine inlet temperature (FTIT) had been decreasing until stall developed in the high-pressure compressor. From this time, FTIT increased towards its maximum temperature limit. The rising FTIT during nonrecoverable stall may be the result of incomplete combustion in the combustor and additional combustion occurring through the turbine. Author

N81-25085# Avco Lycoming Div., Stratford, Conn.

HIGH PERFORMANCE AUXILIARY POWER UNIT TECHNOLOGY DEMONSTRATOR Final Report, 1 Jul. 1977 - 31 Jul. 1980

William Green Wright-Patterson AFB, Ohio AFWAL Dec. 1980 190 p

(Contract F33615-77-C-2015; AF Proj. 2348)

(AD-A098618; LYC-80-55; AFWAL-TR-80-2100) Avail: NTIS HC A09/MF A01 CSCL 10/2

The report covers the design, procurement, and testing of two High-Performance Auxiliary Power Units in the 500 shp class. The program demonstrated the ability of the LPU-101-700 power producer, combined with a modified existing APU in an advanced state of development, to meet Air Force minimum requirements of 1.7 hp/lb and 130 hp/cu ft with an sfc of 1.0 lb/hp-hr or less. Two units were successfully subjected to extensive environmental and endurance testing. Author (GRA)

N81-25086# Hamilton Standard, Windsor Locks, Conn.

RELIABILITY ADVANCEMENT FOR ELECTRONIC ENGINE CONTROLLERS. VOLUME 2: GUIDE TO DEVELOPMENT OF HIGH RELIABILITY ELECTRONIC ENGINE CONTROLLERS Final Report, Aug. 1977 - Apr. 1980

C. Rabinowitz, R. Otterberg, K. Boucher, K. Walworth, and P. Cote Aug. 1980 249 p refs

(Contract F33615-77-C-2055; AF Proj. 3066)

(AD-A098614; HSER-7668-Vol-2; AFWAL-TR-80-2063-Vol-2) Avail: NTIS HC A11/MF A01 CSCL 21/5

Based upon the work done in evolving the preliminary design of 'Volume 1' Final Report: this document has been prepared to serve as a guide for developers of future high reliability gas turbine engine controls. After defining the control modes and

requirements for a variable cycle engine various options are considered regarding system configuration, redundancy management, system simplification, and fault handling. Principles for optimizing component mix and circuit design, along with possibilities for alternative implementations are presented. To successfully control the environmental exposure of the EEC, aspects of thorough packaging design are described. The entire reliability program of an organization plays a key role in the development of high reliability controls. Major elements of a successful program are discussed. Particular emphasis is placed upon implementation of reliability tests and screens designed to enhance electronic hardware reliability. Reliability mathematical modeling techniques are utilized to evaluate control options during system trade studies and to predict and enhance reliability growth during the design and development program and the production program. GRA

N81-25087# Hamilton Standard, Windsor Locks, Conn.
RELIABILITY ADVANCEMENT FOR ELECTRONIC ENGINE CONTROLLERS, VOLUME 1 Final Report, Aug. 1977 - Apr. 1980
C. Radinowits, R. Otterberg, K. Boucher, K. Walworth, P. Cote, M. McGlone (Pratt and Whitney Aircraft), and J. Vernon Wright-Patterson AFB, Ohio AFWAL Jun. 1980 510 p refs (Contract F33615-77-C-2055; AF Proj. 3066)
(AD-A098623; HSER-7667; AFWAL-TR-80-2063-Vol-1) Avail: NTIS HC A22/MF A01 CSCL 21/5

This study presents a comprehensive approach to the development of full-authority electronic engine controls which are capable of meeting the high reliability levels required of aircraft turbine engine controls. The primary groundrules and assumptions are defined, including the variable cycle engine, its control requirements, and service environment. A preliminary design is developed, beginning with a system description and reliability evaluation of a baseline system, including implementation of redundancy, back-up control provisions, and self-test. Through detailed system analyses and electrical and mechanical trade studies, a final preliminary design is derived. (Other topics covered include component baselines for reliability and cost studies, a discussion of reliability technology information exchanges with consulting organizations, a detailed description of reliability improvement measures including various levels of device screening and testing, and a cost of ownership study). Through the effective use of measures such as fault tolerant coverage and selective duplex/triplex redundancy, the final RAEEC system developed can approach high flight safety levels and the goal for maintenance MBTF of 25,000 hours. Author (GRA)

N81-25088# Federal Aviation Administration, Atlantic City, N.J.
ENGINEERING AND DEVELOPMENT PROGRAM PLAN PROPULSION SAFETY
F. Howard Apr. 1981 35 p refs
(AD-A098709; FAA-CT-81-157; FAA-ED-18-5A) Avail: NTIS HC A03/MF A01 CSCL 01/2

Assessment of technology advances relative to existing civil aviation regulations indicates that near and far term research and development is necessary to resolve potential problems areas and to improve the data base required for proper rule-making. Milestone schedules and recommended funding requirements are included for each task. The five areas of investigation are ingestion, durability, stability, fuels, and materials. The overall scope of work in safety and reliability involves investigations and evaluations in three major propulsion program subdivisions and one propulsion functional systems program area. These are: aircraft gas turbine engines, aircraft piston engines, helicopter propulsion systems, and propulsion functional systems and components.
Author (GRA)

N81-25089*# Stevens Inst. of Tech., Hoboken, N. J. Dept. of Mechanical Engineering.
OVERVIEW: NASA/AF/NAVY SYMPOSIUM ON AEROELASTICITY OF TURBINE ENGINES Summary Report
F. Sisto Mar. 1981 67 p Symp. held in Cleveland, 27-29 Oct. 1980 Sponsored in cooperation with NASA and AF
(Contract N00014-79-C-0765; NR Proj. 094-391)
(NASA-CR-164419; AD-A098414; ME-RT-81003) Avail: NTIS HC A04/MF A01 CSCL 21/5

This report is a summarization in overview format of the joint NASA/AF/NAVY Symposium on Aeroelasticity of Turbine Engines held at NASA-Lewis Laboratory on October 27, 28, 29, 1980. Fifty-five presentations were made in unsteady aerodynamics and structural dynamics, including self-excited (flutter) instability and structural dynamics. Both analytical and experimental work was reported. A brief history of the subject and the text of banquet talk are included. GRA

N81-26006# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
CONTRIBUTION TO THE STUDY OF NONSTATIONARY SIGNALS EMITTED BY MOVING JET ENGINES: APPLICATION TO SPECIAL ANALYSIS AND IMAGING. PART 1
Jacques Hay and Max Ernoult *In its* La Rech. Aerospatiale, Bi-Monthly Bull. No. 1980-4 (ESA-TT-672) Mar. 1981 p 69-82 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-4, Jul. - Aug. 1980 p 283-296 Original report in FRENCH previously announced as A80-52918/4
(For primary document see N81-26000 16-99)
Avail: NTIS HC A05/MF A01

N81-26013# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
CONTRIBUTION TO THE STUDY OF NONSTATIONARY SIGNALS EMITTED BY MOVING JET ENGINES: APPLICATION TO SPECTRAL ANALYSIS AND IMAGING. PART 2
Jacques Hay and Max Ernoult *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-5 (ESA-TT-673) Mar. 1981 p 57-73 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-5. Sep. - Oct. 1980 p 353-368
(For primary document see N81-26008 16-99)
Avail: NTIS HC A05/MF A01

N81-26018# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
METALLURGICAL PROBLEMS ENCOUNTERED IN THE CONCEPTION AND DEVELOPMENT OF DIRECTIONALLY SOLIDIFIED COMPOSITES FOR TURBINE BLADE APPLICATIONS
T. Khan and J. F. Stohr *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-6 (ESA-TT-687) Dec. 1980 p 29-58 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-6, Nov. - Dec. 1980 p 399-425 Original report in FRENCH previously announced as A81-19553 (For primary document see N81-26015 16-99)
Avail: NTIS HC A05/MF A01

N81-26022# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
CASCADE DESIGN THROUGH AN INVERSE METHOD
G. Meauze and A. Lesain *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-6 (ESA-TT-687) Dec. 1980 p 91-94 ref Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-6, Nov. - Dec. 1980 p 459-462 Original report in FRENCH previously announced as A81-25875 (For primary document see N81-26015 16-99)
Avail: NTIS HC A05/MF A01

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N81-25090*# Sikorsky Aircraft, Stratford, Conn.
MAIN ROTOR SIX DEGREE-OF-FREEDOM ISOLATION SYSTEM ANALYSIS Final Report
L. B. Eastman Apr. 1981 59 p refs
(Contract NAS1-16168)
(NASA-CR-165665; SER-70471) Avail: NTIS HC A04/MF A01 CSCL 01C

The design requirements of the system have been defined and an isolator concept satisfies these requirements identified. Primary design objectives for the isolation system are 90% attenuation of all NP main rotor shaft loads at a weight penalty

less than or equal to 1% of design gross weight. The configuration is sized for a UH-60A BLACK HAWK helicopter and its performance, risk, and system integration were evaluated through a series of parametric studies. Preliminary design was carried forward to insure that the design is practical and that the details of the integration of the isolator into the helicopter system are considered. Alternate ground and flight test demonstration programs necessary to verify the proposed isolator design are defined. T.M.

N81-26017# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
MODEL VIBRATIONS BELOW LOW SPEED STALL
X. Vaucheret *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-6 (ESA-TT-687) Dec. 1980 p 17-28 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-6, Nov. - Dec. 1980 p 387-397 Original report in FRENCH previously announced as A81-19552 (For primary document see N81-26015 16-99)
Avail: NTIS HC A05/MF A01

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N81-25091# Federal Aviation Administration, Atlantic City, N.J.
TYPE 1106 FLASHER MODIFICATION FOR REMOTE OPERATION Final Report, Jun. - Dec. 1980
Paul H. Jones Mar. 1981 15 p
(FAA Proj. 081-501-810)
(AD-A098527; FAA-CT-81-23) Avail: NTIS HC A02/MF A01 CSCL 13/1

The Federal Aviation Administration (FAA) is presently planning to install an approach lighting system with sequenced flashing lights for category 2 (ALSF-2) on runway 22R at the McGhee-Tyson Airport, Knoxville, Tennessee. This project was performed in response to an Airway Facilities Services request to determine the feasibility of modifying a flasher unit, FAA 1106, to power a remoted FA-9425/1 flasher optical head to be used there. The modification was completed, and the flash tube photometrics met the required specifications. Author (GRA)

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N81-25092*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala. Space Sciences Lab.
UNDERCOOLING MEASUREMENT IN A LOW-GRAVITY CONTAINERLESS ENVIRONMENT
Michael B. Robinson May 1981 65 p refs
(NASA-TM-82423) Avail: NTIS HC A04/MF A01 CSCL 22A

A technique is described for measuring the amount of undercooling for samples processed in a low-gravity containerless environment. The time of undercooling is determined by measuring the time of cooling before nucleation and recalescence by two infrared detectors. Once the cooling curve for each drop is calculated, the amount of undercooling can then be found. The technique is demonstrated by measuring the amount of undercooling for drops of pure niobium and select compositions of the niobium-germanium alloy system while free falling in a 32 m evacuated drop tube. The total hemispherical emissivities and specific heats for these materials were measured using a high-temperature containerless calorimeter. An overview of the effect of undercooling on drops of niobium and niobium-germanium is given. A.R.H.

N81-25093*# System Planning Corp., Arlington, Va. Systems Research and Engineering Div.
MATERIALS PROCESSING THRESHOLD REPORT: 2. USE OF LOW GRAVITY FOR CAST IRON PROCESS DEVELOPMENT Final Report
William L. Frankhouser Feb. 1980 40 p refs
(Contract NAS8-33518)
(NASA-CR-161796; SPC-565) Avail: NTIS HC A03/MF A01 CSCL 22A

Potential applications of a low gravity environment of interest to the commercial producers of cast iron were assessed to determine whether low gravity conditions offer potential opportunities to producers for improving cast iron properties and expanding the use of cast irons. The assessment is limited to the gray and nodular types of iron, however, the findings are applicable to all cast irons. The potential advantages accrued through low gravity experiments with cast irons are described. E.A.K.

N81-25094# Deutsche Gesellschaft fuer Luft- und Raumfahrt, Cologne (West Germany).
SPACELAB PAYLOAD. MATERIALS SCIENCE AND PROCESSING IN SPACE [SPACELAB-NUTZUNG. WERKSTOFFORSCHUNG UND VERFAHRENSTECHNICK IM WELTRAUM]
1980 290 p refs Partly in GERMAN and ENGLISH Proc. of Bundesministerium fuer Forsch. und Technol. Status-Seminar 1979, Munich, 18-20 Sep. 1979
(DGLR-80-01; ISBN-3-922010-17-2) Avail: NTIS HC A13/MF A01

Principal topics are physical chemistry and processing techniques, boundary layer and transport phenomena, metals and compound materials, and single crystals. Emphasis is placed on the effects of weightlessness on crystal growth. Reduced gravity experiments are described for zone melting. For individual titles, see N81-25095 through N81-25117.

N81-25095# Bundesministerium fuer Forschung und Technologie, Bonn (West Germany).
THE PROGRAM UNDER GERMAN SPONSORSHIP FOR MATERIALS RESEARCH AND PROCESSING TECHNOLOGY IN SPACE [DAS DEUTSCHE FOERDERUNGSPROGRAMM FUER WERKSTOFFORSCHUNG UND VERFAHRENSTECHNIK IM WELTRAUM]
Gottfried Greger *In* DGLR Spacelab Payload. Mater. Sci. and Processing in Space 1980 p 7-24 In GERMAN (For primary document see N81-25094 16-12)
Avail: NTIS HC A13/MF A01

The setup of rocket-borne experiments, used to assess the practicability of proposed Spacelab experiments, was reviewed. Two projects are emphasized: technological experiments under zero gravity (TEXUS), and materials science autonomous experiments under zero gravity (MAUS). Experiment alternatives evaluated to date are listed. Individual experimental designs are considered, including an isothermal multichamber oven and a gas container. The MAUS payload configuration with and without typical experiment subsystems is shown. The mounting of MAUS modules in the cargo bay of a space shuttle orbiter is illustrated. A carrier for shuttle pallet satellite missions is proposed. Its application in a Spacelab configuration, including sled, and in a short Spacelab module configuration are described. Author (ESA)

N81-25096# Ruhr Univ., Bochum (West Germany). Inst. fuer Thermo- und Fluiddynamik.
CONSTRUCTION OF A MEASURING APPARATUS FOR PRESSURE DENSITY AND TEMPERATURE MEASUREMENT IN THE CRITICAL REGION OF PURE FLUIDS ONBOARD SPACELAB [AUFBAU EINER MESSAPPARATUR ZUR DRUCK-, DICHTE-, TEMPERATURMESSUNG IM KRITISCHEN GEBEIT REINER FLUIDER STOFFE IM SPACELAB]
W. Wagner, H.-G. Kratz, and W. Pentermann (Tech. Univ., Brunswick) *In* DGLR Spacelab Payload. Mater. Sci. and Processing in Space 1980 p 29-37 refs In GERMAN (For primary document see N81-25094 16-12)

Avail: NTIS HC A13/MF A01

Zero-gravity research into thermodynamic phenomena in the critical region of fluids is considered. The utilization of Spacelab facilities is required. Equations of condition and the critical region are elaborated. Resulting principles are used to explain techniques for measuring pressure, density and temperature. Attainable accuracy, the choice of test samples, and the design of adequate measuring apparatus are treated. Immediate implications of thermodynamic investigations in a weightless environment are listed. Author (ESA)

N81-25097# Gesamthochschule, Siegen (West Germany). Fachbereich 8.

MEASURING THERMAL CONDUCTIVITY AT ELEVATED PRESSURES AND TEMPERATURES [MESSUNG DER WAERMELEITFAEHIGKEIT BEI ERHOEHTEN DRUECKEN UND TEMPERATUREN]

H. Lentz, G. P. Goerler (DFVLR, Cologne), and A. Bewersdorff (DFVLR, Cologne) *In* DGLR Spacelab Payload. Mater. Sci. and Processing in Space 1980 p 39-47 refs In GERMAN (For primary document see N81-25094 16-12)

Avail: NTIS HC A13/MF A01

A Spacelab experiment is suggested, involving the measurement of thermal conductivity in fluid media over a wide temperature range and under high pressure. The Spacelab facilities are required in order to minimize gravity induced convection disturbances during measurement. Principles of heat conduction and convection in fluid media were reviewed. Three techniques for measuring thermal conductivity in fluids under stationary conditions are compared; i.e., the parallel plate method, a coaxial cylinder method, and a hot-wire method. Application of the hot-wire method under unstationary conditions is then considered. Results of the implementation of these methods are reported from the literature, and the influence of convection is pointed out. Author (ESA)

N81-25098# Technische Hochschule, Aachen (West Germany). Inst. fuer Physikalische Chemie.

ULTRASONIC INVESTIGATION OF SIMPLE SALT MELTS [ULTRASCHALLUNTERSUCHUNGEN AN EINFACHEN SALZSCHMELZEN]

Manfred H. Keller and Joachim Richter *In* DGLR Spacelab Payload. Mater. Sci. and Processing in Space 1980 p 49-57 refs In GERMAN (For primary document see N81-25094 16-12)

Avail: NTIS HC A13/MF A01

The measurement of ultrasonic velocity and absorption in molten salts is considered. Theory relating sound field characteristics to the molecular structure of salt melts is presented. Analytic results are used in devising measurement techniques. An optical method which determines sonic velocity and absorption through the evaluation of an ultrasonic grating effect is proposed. An impulse transmissivity measurement apparatus, based on quartz oscillators, is also depicted. Both apparatus are extremely sensitive to gravity induced convection, as evidenced by comparison of laboratory results with computerized simulations. Author (ESA)

N81-25099# Bayer A. G., Leverkusen (West Germany).

STRUCTURES OF LIGHT ABSORBENT COMPOUNDS IN NEAR-SURFACE LAYERS [STRUKTUREN LICHTABSORBIERENDER ASSOZIATE IN OBERFLAECHENNAHEN SCHICHTEN]

Uwe Claussen and Alfred Zembrod *In* DGLR Spacelab Payload. Mater. Sci. and Processing in Space 1980 p 59-63 In GERMAN (For primary document see N81-25094 16-12)

Avail: NTIS HC A13/MF A01

Chemical reaction stability of synthetic organic substances (polymers) is considered. Specifically, light as an initiator of decomposition reactions is studied, and a scheme for limiting its adverse absorption in materials through the constitution of fluorescent dye near-surface layers during manufacture is proposed. Ultrafast spectroscopy was used to characterize fluorescence lifetime of dye substances. Different substrates and polymer buildups (cellophane, polyamide, etc.) were tested. Results show that dyes having the briefest fluorescent lifetime make for the best light resistant structures. Furthermore, an oligomer structure is optimal, but is only possible under zero gravity. Author (ESA)

N81-25100# Technische Universitaet, Brunswick (West Germany).

HOLDERLESS MEASUREMENT TECHNIQUE: DETERMINATION OF REACTION ENTHALPY [HALTERUNGSFREIE MESSTECHNIK - BESTIMMUNG VON REAKTIONSENTHALPIEN]

Wolfgang Hemminger, Frank Haessner, and Hans-Leo Lukas (Max Planck Inst. fuer Metallforsch.) *In* DGLR Spacelab Payload. Mater. Sci. and Processing in Space 1980 p 65-71 refs In GERMAN (For primary document see N81-25094 16-12)

Avail: NTIS HC A13/MF A01

A calorimeter measurement system which determines heat content of alloy melts under zero gravity conditions is described. Its implementation onboard Spacelab is foreseen. The system design is detailed, i.e., calorimeter, test sample manipulator and positioning apparatus, and furnace. Measurement interference effects due to the experimental setup are discussed. The measurement procedure is given. The use of this system extends the application of solution calorimetry to the study of highly reactive metals, e.g., Ti, Zr, Hf, V, Nb, and Ta, which previously could not be characterized because of spurious reactions with the crucible. Author (ESA)

N81-25101# Karlsruhe Univ. (West Germany). Inst. fuer Stroehungslehre und Stroemungsmaschinen.

INTRODUCTION TO THE THEORY OF CONVECTIVE TRANSPORT PROCESSES [EINFUEHRUNG IN DIE THEORIE KONVEKTIVER TRANSPORTVORGAENGE]

H. Oertel *In* DGLR Spacelab Payload. Mater. Sci. and Processing in Space 1980 p 77-86 refs In GERMAN (For primary document see N81-25094 16-12)

Avail: NTIS HC A13/MF A01

Theory and descriptive equations of three generalized convection processes, i.e., thermal convection, diffusion convection, and Marangoni convection, are presented. A computation method is established, and a numerical example of thermal convection is calculated. The analysis is restricted to thermal cell-type convection. Stationary, time dependent, and three dimensional convection are described. Cell convection in a rotating container is also treated. Results demonstrate that convective transport theory in conjunction with the proposed numerical method are well adapted to the quantitative preparation of spaceborne experiments. Author (ESA)

N81-25102# Technische Univ., Berlin (West Germany). Inst. fuer Nichtmetallische Werkstoffe.

INTERFACIAL CONVECTION UNDER REDUCED GRAVITY

Rolf Bruecker *In* DGLR Spacelab Payload. Mater. Sci. and Processing in Space 1980 p 87-95 refs Sponsored by Bundesministerium fuer Forschung und Technologie (For primary document see N81-25094 16-12)

Avail: NTIS HC A13/MF A01

Three fundamental experiments on interfacial convection were performed under microgravity ($g = 0.0001$) and normal gravity conditions. During rocket flight, concentration induced interfacial convection, thermally induced interfacial convection, and material exchange behavior due to interfacial convection combined with density instability were observed. These observations were then compared with data from the same experiments, but carried out in the laboratory. Results show that for the first two experiments, convection behavior is similar. For the third experiment, interfacial-energetic equilibrium processes under microgravity produce remarkable transport actions. Author (ESA)

N81-25103# Erlangen-Nuremberg Univ. (West Germany). Inst. fuer Werkstoffwissenschaften 6.

CONVECTIVE TRANSPORT PROCESSES IN METAL AND SEMICONDUCTOR MELTS [KONVEKTIVE TRANSPORTVORGAENGE IN METALL- UND HALBLEITERSCHMELZEN]

Georg Mueller *In* DGLR Spacelab Payload. Mater. Sci. and Processing in Space 1980 p 97-105 refs In GERMAN (For primary document see N81-25094 16-12)

Avail: NTIS HC A13/MF A01

The contribution of convection to the kinetics of liquid-solid phase transformations, associated with crystal growth methods and arrangements, is discussed. Both free and forced convection are considered. The forces acting on a flow regime (convective

transport) are established and modeled. Convection in a melt (InSb) during crystal growth under elevated gravity conditions was studied experimentally using a zone melting technique. Results show the relationship of material inhomogeneity and temperature fluctuations during solidification to gravity induced convection.
Author (ESA)

N81-25104# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
DISSIPATIVE STRUCTURES IN CHEMICAL REACTIONS [DISSIPATIVE STRUKTUREN IN CHEMISCHEN REAKTIONEN]
A. Bewersdorff *In* DGLR Spacelab Payload. Mater. Sci. and Processing in Space 1980 p 107-111 refs In GERMAN (For primary document see N81-25094 16-12)
Avail: NTIS HC A13/MF A01

Thermodynamic irreversible processes in nonequilibrium chemical reaction systems are considered. Complex behavior, such as the time dependent oscillations in redox-potentials observed during the Zhabotinski reaction, is discussed, and a partial differential equation system for the phenomenon is presented. An analogy with hydrodynamic instabilities is revealed. The possibility of the formation of dissipative structures as a self organizing reaction mechanism is discussed. An experimental design to further elucidate this mechanism is proposed, and reduced gravity requirements are justified. Author (ESA)

N81-25105# Fraunhofer-Gesellschaft, Stuttgart (West Germany).
WETTING KINETIC PROCESSES IN TUBES UNDER SIMULATED WEIGHTLESSNESS [BENETZUNGSKINETISCHE VORGAENGE IN ROHREN UNDER SIMULIERTER SCHWERELOSIGKEIT]
E. Maisch, D. Renzow, P. J. Sell, and E. Walitza *In* DGLR Spacelab Payload. Mater. Sci. and Processing in Space 1980 p 113-120 refs In GERMAN (For primary document see N81-25094 16-12)
Avail: NTIS HC A13/MF A01

The kinetics of capillary flow, and particularly the influence of wetting on the capillary inner surface, were studied experimentally and theoretically. A experimental setup, containing tubes of different geometries, was used to film the flow development. Gravitational effects which usually dominate capillary flow were suppressed. The equilibrium form of the meniscus is modeled, using the Gauss-Laplace equation. Results show the inertial action of meniscus formation. In consideration of all essential forces, calculations predict a meniscus of minimal surface energy for each tube geometry. Calculations agree well with observations, and spaceborne experiments are suggested to verify the findings. Author (ESA)

N81-25106# Essen Univ. (West Germany).
ON THE DYNAMICS OF BUBBLES AND DROPS [ZUR DYNAMIK VON BLASEN UND TROPFEN]
J. Siekmann *In* DGLR Spacelab Payload. Mater. Sci. and Processing in Space 1980 p 121-136 refs In GERMAN (For primary document see N81-25094 16-12)
Avail: NTIS HC A13/MF A01

Equations of motion for nondeformed bubbles under reduced gravity as well as for the equilibrium form of rotating liquid bodies in a weightless environment are surveyed. The behavior of individual bubbles and pairs of bubbles is emphasized. Gas bubble motion in a Hele-Shaw canal is described. The behavior of bubbles with and without a surface film is modeled in dimensionless form. An extension to bubble motion in a temperature field is made. The application of single bubble dynamics to understanding bubble swarm dynamics is treated. Gas bubble motion in a rotating liquid is then introduced. Expressions for bubble motion in an inertial system and for rotating liquid drops in an electric field complete the review.
Author (ESA)

N81-25107# Brown, Boveri und Cie, A.G., Heidelberg (West Germany). Zentrales Forschungslabor.
MATERIALS TECHNOLOGY FOR METALS AND COMPOUND MATERIALS IN A WEIGHTLESS ENVIRONMENT [ZUSAMMENFASSUNG ZUM SCHWERPUNKT METALLE UND VERBUNDWERKSTOFFE]
P. R. Sahm *In* DGLR Spacelab Payload. Mater. Sci. and Processing in Space 1980 p 139-173 refs In GERMAN (For primary document see N81-25094 16-12)
Avail: NTIS HC A13/MF A01

Applications to space processing are surveyed. Microscopic processes in transition metal crystal growth fronts (as well as in nonmetal systems) are emphasized. Dendritic crystallization and the intermixing of discrete phases (solid, liquid or gas formed) are discussed. Results simultaneously provide a basis for further macroscopic studies and for user oriented research, i.e., block solidification, soldering and welding applications. Thermodynamic kinetic processes, such as homogeneous seed formation in solidifying containerless melts, are also considered for their impact both on terrestrial and space technology. Author (ESA)

N81-25108# Technische Univ., Berlin (West Germany). Inst. fuer Metallforschung.
FEASIBILITY DEMONSTRATED THROUGH MICROGRAVITY EXPERIMENTATION ON DIFFUSION AND TRANSPORT IN METALLIC SALTS [AUSSAGEMOEGLICHKEITEN DURCH MIKRO-G-EXPERIMENTE BEI DIFFUSION UND TRANSPORT IN METALLISCHEN SCHMELZEN]
Hans Wever, Guenter Frohberg, and Kurt-Helmut Kraatz *In* DGLR Spacelab Payload. Mater. Sci. and Processing in Space 1980 p 175-188 refs In GERMAN (For primary document see N81-25094 16-12)
Avail: NTIS HC A13/MF A01

Experiments under microgravity conditions which help explain convection phenomena in metallic melts are examined. Conditions are sought under which convection is avoided in a microgravity environment. The diffusion mechanism is elucidated, and as a corollary the magnitude of the temperature dependence of the diffusion coefficients is considered. Isotopic effects and the Kirkendall effect are treated. Author (ESA)

N81-25109# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Festkoerperforschung.
NOTES ON TECHNOLOGICAL PARAMETERS FOR DIRECTIONAL SOLIDIFICATION OF CRYSTAL GROWTH MELTS UNDER ZERO GRAVITY [NOTIZEN ZU TECHNOLOGISCHE PARAMETER FUER GERICHTETE ERSTARRUNG VON KRISTALLZUCHTSCHMELZEN UNTER SCHWERELOSIGKEIT]
Helmut Wenzl *In* DGLR Spacelab Payload. Mater. Sci. and Processing in Space 1980 p 189-199 refs In GERMAN (For primary document see N81-25094 16-12)
Avail: NTIS HC A13/MF A01

Dominant phenomena in directional solidification, particularly in application of the Bridgman method, are recapitulated. Crucible design requirements for experiments under zero gravity are established. Effective heating and cooling techniques in regard to experiment automation are set forward. Directional solidification in the absence of convection is characterized. Menisci forms are discussed. Hydrostatic and hydrodynamic expressions are given. Both conventional and unconventional crucibles are discussed. Of the heating and cooling schemes reviewed, a system of hydrogen-metal evaporation or condensation is favored.
Author (ESA)

N81-25110# Max-Planck-Institut fuer Metallforschung, Stuttgart (West Germany). Inst. fuer Werkstoffwissenschaften.
WETTING BEHAVIOR BETWEEN THE PHASES OF SYNTHETIC COMPOUND MATERIALS IN RELATION TO THEIR MANUFACTURE UNDER MICROGRAVITY CONDITIONS [BENETZUNGSVERHALTEN ZWISCHEN DEN PHASEN KUENSTLICHER VERBUNDWERKSTOFFE IM HINBLICK AUF HIRE HERSTELLUNG UNTER MIKROGRAVITATION]
Josef Haag *In* DGLR Spacelab Payload. Mater. Sci. and Processing in Space 1980 p 201-211 refs In GERMAN (For primary document see N81-25094 16-12)
Avail: NTIS HC A13/MF A01

The manufacture of composites from immiscible materials, under microgravity conditions, is treated theoretically. The control of wettability is stressed. Equilibrium wetting is described. The dependence of surface energy on wetting angle is analyzed. Studies on the manufacture of composites with powder techniques are interpreted, and an alternative method for compounding under microgravity conditions is offered. Given the overall surface energy of a known wetting situation, rather than controlling the

equilibrium point of the system, the separation processes of a pressed powder mix is minimized by the introduction of small amounts of a gas phase. Author (ESA)

N81-25111# Man-Turbomotoren G.m.b.H., Munich (West Germany).
TECHNOLOGICAL POTENTIAL OF SHAPE SUPPORTIVE INTEGUMENTS [POTENTIAL DER STUETZHAUT-TECHNOLOGIE.]
H. Sprenger, K. Schweitzer (Motoren und Turbinen Union), and P. R. Sahm (Brown, Boverie und Cie., Heidelberg) *In* DGLR Spacelab Payload. Mater. Sci. and Processing in Space 1980 p 213-227 refs In GERMAN (For primary document see N81-25094 16-12)
Avail: NTIS HC A13/MF A01

The scientific and technological applications of shape supportive integuments are assessed. The shape supportive integument concept is explained, i.e., a finished part (e.g., turbine blade) is coated with a thin, rigid skin which has excellent heat transmission properties; the part undergoes melting, then directional solidification while its exact shape is maintened by the skin; the skin is removed. The optimization of the process is emphasized. Characterization of the reciprocal action between the skin and the melt is stressed. Author (ESA)

N81-25112# Hochschule der Bundeswehr, Hamburg (West Germany). Lab. fuer Werkstoffkunde und Schweisstechnik.
LIQUID PHASE JOINING UNDER MICROGRAVITY CONDITIONS [FUEGEN MIT FLUESSIGER PHASE UNTER MIKROGRAVITATION]
H. Hoffmeister and J. Ruediger *In* DGLR Spacelab Payload. Mater. Sci. and Processing in Space 1980 p 229-236 refs In GERMAN (For primary document see N81-25094 16-12)
Avail: NTIS HC A13/MF A01

Experiments in arc welding under microgravity conditions are reviewed. The quantification of welding parameters which lead to optimal weld strength is discussed. Studies involving low current density are emphasized. Besides electrodynamic forces, the influences of viscosity, surface tension, and mass flow on metal transfer from the electrode to the weld puddle are discussed. Observations under reduced gravity of drop development at the tip of a melting electrode are studied. The dependence of drop diameter on current intensity is established. Author (ESA)

N81-25113# Consortium fuer Elektrochemische Industrie G.m.b.H., Munich (West Germany).
THE PREPARATION OF SPACELAB EXPERIMENTS WITH SILICON [DIE VORBEREITUNG VON SPACELAB-EXPERIMENTEN MIT SILICIUM]
Helmut Koelker *In* DGLR Spacelab Payload. Mater. Sci. and Processing in Space 1980 p 241-252 refs In GERMAN (For primary document see N81-25094 16-12)
Avail: NTIS HC A13/MF A01

Two experiments, planned for the first Spacelab mission, are described: (1) the crystallization of a silicon sphere; and (2) zone melting of silicon. Experiment (1) is concerned with the occurrence of striations, i.e., flow phenomena in the melt which contribute to the initiation of striation. Both rotating and nonrotating crystal growth media are used. Experiment (2) establishes the charateristics of striation when zone melting is employed. Author (ESA)

N81-25114# Stuttgart Univ. (West Germany). Physikalisches Inst.
SOLUTION ZONE GROWTH OF 3-5 AND 2-6 COMPOUNDS [LOESUNGSZONENZUECHTUNG VON 3-5 UND 2-6-VERBINDUNGEN]
Klaus-W. Benz *In* DGLR Spacelab Payload. Mater. Sci. and Processing in Space 1980 p 253-258 refs In GERMAN (For primary document see N81-25094 16-12)
Avail: NTIS HC A13/MF A01

Crystal growth experiments in preparation for the first Spacelab payload are reported using GaSb as a test substance. Crystal growth was investigated using a vertical traveling heater method, a mirror furnace, and a process for controlling a containerless melt, with CdTe as the test subject. Single crystal growth in solution zones, obtained with a mirror furnace similar to the Spacelab apparatus, is discussed. Author (ESA)

N81-25115# Freiburg Univ. (West Germany). Kristallographisches Inst.
GAS ZONE GROWTH IN A MIRROR FURNACE [GASZONENZUECHTUNG IM SPIEGELOFEN]
A. Eyer, R. Nitsche, M. Schumacher, and H. Walcher *In* DGLR Spacelab Payload. Mater. Sci. and Processing in Space 1980 p 259-269 refs In GERMAN (For primary document see N81-25094 16-12)
Avail: NTIS HC A13/MF A01

Experiments in crystal growth from a melt, specifically those employing a mirror furnace as heat source, are reported. Single and polycrystal growth out of a gas zone are discussed. A method for CdTe crystal growth out of a gas zone through sublimation is described. The growth of ZnS crystals out of a gas zone through chemical transport with iodine is discussed. The role of the mirror furnace in both methods is explained. Crystals obtained in the laboratory approach for the crystal structure expected with similar processes under microgravity. Author (ESA)

N81-25116# Freiburg Univ. (West Germany). Chemisches Lab.
TEMPERATURE DEPENDENT SOLUTION ZONE GROWTH OF PROTEIN SINGLE CRYSTALS UNDER NORMAL AND REDUCED GRAVITY [TEMPERATURABHAENGE LOESUNGSZONENZUECHTUNG VON PROTEIN-EINKRISTALLEN UNTER NORMALER UND VERMINDERTER GRAVITATION]
Walter Littke *In* DGLR Spacelab Payload. Mater. Sci. and Processing in Space 1980 p 271-278 refs In GERMAN (For primary document see N81-25094 16-12)
Avail: NTIS HC A13/MF A01

A protein crystallization machine, which can be included in the Spacelab equipment, was developed and built. Two test enzymes (lysozyme and beta-galactosidase) were crystallized in the temperature range minus 10 C to plus 20 C. The design of the crystallization apparatus is explained. Beta-galactosidase single crystals are shown in X-ray diffraction photographs. Author (ESA)

N81-25117# Erlangen-Nuremberg Univ. (West Germany). Inst. fuer Werkstoffwissenschaften 6.
INVESTIGATION OF GROWTH PARAMETERS FOR THE DIRECTIONAL SOLIDIFICATION OF InSb-NiSb EUTECTICS [UNTERSUCHUNGEN VON WACHSTUMSPARAMETERN BEI DER GERICHTETEN ERSTARRUNG DES InSb-NiSb EUTEKTIKUMS]
Peter Kyr and Georg Mueller *In* DGLR Spacelab Payload. Mater. Sci. and Processing in Space 1980 p 279-289 refs In GERMAN (For primary document see N81-25094 16-12)
Avail: NTIS HC A13/MF A01

An experimental setup in conjunction with a cartridge specimen geometry is presented which makes possible the demarcation of solid-liquid phase boundaries during directional solidification of eutectics. The method is based on stroboscopic photography. The equipment and experimental method are described. The interrelationship between crystal growth velocity, the temperature gradient in the melt, and the form or organization of the solid-liquid boundaries is shown. Author (ESA)

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

No abstracts in this category.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N81-25118*# Martin Marietta Corp., Denver, Colo.
CONCEPTUAL DESIGN AND ANALYSIS OF ORBITAL CRYOGENIC LIQUID STORAGE AND SUPPLY SYSTEMS
Final Report, Dec. 1979 - Mar. 1981
R. N. Eberhardt, G. R. Cunnington, and W. A. Johns May 1981 181 p refs
(Contract NAS3-22264)
(NASA-CR-165321; MCR-81-546) Avail: NTIS HC A09/MF A01 CSCL 22B

A wide variety of orbital cryogenic liquid storage and supply systems are defined in NASA and DOD long-range plans. These systems include small cooling applications, large chemical and electrical orbit transfer vehicles and supply tankers. All have the common requirements of low-g fluid management to accomplish gas-free liquid expulsion and efficient thermal control to manage heat leak and tank pressure. A preliminary design study was performed to evaluate tanks ranging from 0.6 to 37.4 cu m (22 to 1320 cu ft). Liquids of interest were hydrogen, oxygen, methane, argon and helium. Conceptual designs were generated for each tank system and fluid dynamic, thermal and structural analyses were performed for Shuttle compatible operations. Design trades considered the paradox of conservative support structure and minimum thermal input. Orbital performance and weight data were developed, and a technology evaluation was completed. Author

N81-26003# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
ONERA RAMJET TEST FACILITIES
Pierre Berton and Dominique Regard *In its* La Rech. Aerospatiale, Bi-Monthly Bull. No. 1980-4 (ESA-TT-672) Mar. 1981 p 25-44 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-4, Jul. - Aug. 1980 p 241-258 Original report in FRENCH previously announced as A80-52915/4
(For primary document see N81-26000 16-99)
Avail: NTIS HC A05/MF A01

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N81-25119*# Operations Research, Inc., Silver Spring, Md.
NOSS/ALDCS ANALYSIS AND SYSTEM REQUIREMENTS DEFINITION Final Report, May 1980 - Feb. 1981
D. L. Reed and R. G. Wallace Feb. 1981 150 p refs
(Contract NAS5-26164)
(NASA-CR-166691; ORI-TR-1864) Avail: NTIS HC A07/MF A01 CSCL 22A

The results of system analyses and implementation studies of an advanced location and data collection system (ALDCS), proposed for inclusion on the National Oceanic Satellite System (NOSS) spacecraft are reported. The system applies Doppler processing and radiofrequency interferometer position location technqiues both alone and in combination. Aspects analyzed include: the constraints imposed by random access to the system by platforms, the RF link parameters, geometric concepts of position and velocity estimation by the two techniques considered, and the effects of electrical measurement errors, spacecraft attitude errors, and geometric parameters on estimation accuracy. Hardware techniques and trade-offs for interferometric phase measurement, ambiguity resolution and calibration are considered. A combined Doppler-interferometer ALDCS intended to fulfill the NOSS data validation and oceanic research support mission is also described. E.A.K.

N81-25120*# National Aeronautics and Space Administration, Washington, D. C.
IMPROVED NOAA SATELLITE SCHEDULED FOR LAUNCH
William J. Brennan (NOAA, Rockville, Md.), Dick McCormack, and Ken Senstad 12 Jun. 1981 19 p
(NASA-News-Release-81-76; P81-10077) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 22A

A description of the NOAA-C satellite and its Atlas launch vehicle are presented. The satellite instrumentation and data transmission systems are discussed. A flight sequence of events *is given along with a listing of the mission management* responsibilities. T.M.

N81-25121*# *Texas Univ. at Arlington. Applied Research* Labs.
EFFECTS OF IONOSPHERIC TURBULENCE ON SPS PILOT *SIGNAL Final Report, 1 Mar. - 1 Dec. 1980*
James R. Clynch 24 Feb. 1981 112 p refs
(Contract NAS9-16086)
(NASA-CR-160959; ARL-TR-81-13) Avail: NTIS HC A06/MF A01 CSCL 22B

The spatial variation of the electron density was studied by monitoring the differential Doppler on radio beacons aboard the Navy navigation satellites. The radio frequency heater was used to deposit energy in the F-region ionosphere with the heating frequency above peak plasma frequency. The effects of the solar power satellite power beam on the pilot signal were simulated. It was found that a small depletion was formed in the beam and that there was turbulence in the elctron density up the magnetic field line from the beam. It is suggested that the depletion will not seriously affect the power or pilot beams of the solar power satellite. E.A.K.

N81-25122*# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Electrical, Computer and Systems Engineering.
SPS FLEXIBLE SYSTEM CONTROL ASSESSMENT ANALYSIS Final Report
Mark J. Balas 15 Mar. 1981 163 p refs
(Contract NAS9-16053)
(NASA-CR-160962) Avail: NTIS HC A08/MF A01 CSCL 22B

Active control of the Satellite Power System (SPS0, a large mechanically flexible aerospace structure is addressed. The control algorithm is the principle component in the feedback link from sensors to actuators. An analysis of the interaction of the SPS structure and its active control system is presented. E.A.K.

N81-25123# Auburn Univ., Ala. Dept. of Aerospace Engineering.
LAUNCHERS AS PASSIVE CONTROLLERS Interim Report, 27 Feb. - 31 Dec. 1980
John E. Cochran, Jr. 31 Dec. 1980 109 p refs
(Contract DAAH01-80-C-0523)
(AD-A096801; AD-E950105; TR-RL-CR-81-2) Avail: NTIS HC A06/MF A01 CSCL 19/7

The passive control capability of launchers for free flight rockets is investigated. The causes of free flight rocket dispersion, principally thrust alignment, are considered. The concept of passive control and the potential of launchers as passive controllers are discussed. The control of free flight rockets by altering launch conditions and the conditions caused by rocket imperfections are considered. The nonlinear frequency response of a launcher/rocket system is used to define frequency bands resulting in favorable launch conditions. The limited numerical results obtained indicate that a non-tipoff light weight launcher or sublauncher is effective as a passive controller of rocket dispersion within a very high and a fairly low frequency band. Operation within a low frequency band produces better control of a tipoff launcher. Theoretically, dispersion can be reduced to less than 50% of the rigid launcher value. J.D.H.

N81-25124# Naval Postgraduate School, Monterey, Calif.
A COMPUTER STUDY OF THE EFFECT OF ICE CLOUDS ON THE CEP OF A ZERO-LIFT REENTRY BODY

M.S. Thesis

Martin Warren Mellor Dec. 1980 102 p refs
(AD-A098474) Avail: NTIS HC A06/MF A01 CSCL 12/1

The reentry trajectory of a bluff zero-lift reentry body was computed using an HP-9845A computer. To obtain the external shape of an ablating reentry body was as a function of altitude, coefficients for polynomial equations were determined. At six discrete altitudes, the calculated nose shapes were identical to published information for the nose shapes of a reentry body with silaceous ablation material. Newtonian flow and an exponential atmosphere were assumed throughout. The computer program was modified to include ablation due to ice crystal erosion, and the trajectory was recalculated for a model ice cloud 5,000 feet thick at an altitude of 30,000 feet. A total of four trajectories was computed for various values of mass loss fraction for erosion due to ice. The differences in range from the initial trajectory without ice erosion were one to fifteen feet. Author (GRA)

N81-25125# *Avco Systems Div., Wilmington, Mass.*
MINUTEMAN 3/MARK 12A REENTRY CARBON-CARBON NOSETIP PRODUCTION General Test Report, 1 Mar. - 31 May 1980
10 Jun. 1980 35 p
(Contract F04704-78-C-0036)
(AD-A098594; AVSD-0186-80-CR) Avail: NTIS
HC A03/MF A01 CSCL 16/3

One densified billet out of each 36 processed is randomly selected and subjected to the Production Lot Sampling Tests specified in paragraph 5.2.3 of the Equipment Test Plan, AVSD-0325-78-CR dated 14 March 1979. During this report several PLS billets were tested. These are as follows: PLS-5 from densification Lot 6, PLS-6 from densification Lot 8, PLS-7 from densification Lot 9, PLS-8 from densification Lot 10 and PLS-9 from densification Lot 11. All data has been compiled on previously presented Figures 7, 8, and 9 from the Equipment Test Plan, and included herein as the General Test Report, Production Lot Sampling, in accordance with CDRL Sequence Number 081A2. GRA

N81-25126# Avco Systems Div., Wilmington, Mass.
MINUTEMAN 3/MARK 12A REENTRY VEHICLE CARBON-CARBON NOSETIP PRODUCTION General Test Report, 1 Jan. - 31 Mar. 1980
14 Apr. 1981 9 p
(Contract F04704-80-C-0011)
(AD-A098593; AVSD-0015-80-CR) Avail: NTIS
HC A02/MF A01 CSCL 16/3

One densified billet out of each 36 processed is randomly selected and subjected to the Production Lot Sampling Tests specified in paragraph 5.2.3 of the Equipment Test Plan, AVSD-0115-80-CR dated 4 April 1980. This particular PLS (5) was taken from General Electric Densification Lot number 6. The ten nosetip assemblies delivered under the subject contract were taken from this lot. All of the test results obtained were within specification limits and there are no anomalies to be reported. All data has been compiled on previously presented Figures 7, 8, and 9 from the Equipment Test Plan, and included herein as the General Test Report, Production Lot Sampling, in accordance with CRDL Sequence Number 081A2. GRA

N81-25127# Avco Systems Div., Wilmington, Mass.
MINUTEMAN 3/MARK 12A REENTRY VEHICLE CARBON-CARBON NOSETIP PRODUCTION General Test Report, 1 Sep. - 31 Nov. 1979
21 Feb. 1980 22 p refs
(Contract F04704-78-C-0036)
(AD-A098592; AVSD-0058-80-CR) Avail: NTIS
HC A02/MF A01 CSCL 16/3

One densified billet out of each 36 processed is randomly selected and subjected to the Production Lot Sampling Tests specified in paragraph 5.2.3 of the Equipment Test Plan, AVSD-0325-80-CR dated 14 March 1979. Several test results were encountered which did not fall within the values specified in the individual Quality Assurance Test Procedures. A summary of all the test results from PLS-2, -3, and -4 and rationale concerning the variances is presented. All data has been compiled on previously presented Figures 7, 8, and 9 from the Equipment Test Plan, and included herein as the General Test Report, Production Lot Sampling, in accordance with CRDL Sequence Number 081A2. GRA

N81-25128# *Avco Systems Div., Wilmington, Mass.*
MINUTEMAN 3/MARK 12A REENTRY VEHICLE CARBON-CARBON NOSETIP PRODUCTION PROGRAM Critical Item Control Plan
28 May 1980 34 p refs
(Contract F04704-80-C-0011)
(AD-A098595; AVSD-0114-80-CR) Avail: NTIS
HC A03/MF A01 CSCL 16/3

The purpose of this document is to provide SAMSO with Avco's current plan for critical item control and subsequent monitoring of the manufacturing processes in production of the Mark 12A Carbon/Carbon nosetip. GRA

N81-25129# Messerschmidt-Boelkow G.m.b.H., Munich (West Germany).
UNSTEADY AERODYNAMICS OF MISSILES. PART 3: DETERMINATION OF THE LONGITUDINAL STABILITY OF WINGS AT HIGH ANGLES OF ATTACK IN SUPERSONIC FLIGHT [INSTATIONAERE BEIWERTE VON FLUGKOERPERN, TEIL 3. DERIVATIVE DER LAENGSSTABILITAET VON FLUEGELN BEI HOHEN ANSTELLWINKELN IN UEBERSCHALLSTROEMUNG]
C. P. Schneider Bonn Bundesministerium der Verteidigung 1980 56 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium der Verteidigung
(BMVg-FBWT-80-8) Avail: NTIS HC A04/MF A01

A theoretical method for the determination of unsteady aerodynamic coefficients associated with the longitudinal stability of slender wings in supersonic flight is presented. It is based on the indicial functional theory of Tobak. Extension to higher incidences is effected by combining the indicial functions with steady nonlinear coefficients derived from a semiempiricial procedure. The unsteady nonlinear aerodynamic coefficients are determined for delta wings with subsonic and supersonic leading edges, respectively. Author (ESA)

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

N81-25130*# Martin Marietta Corp., Denver, Colo.
INFRARED IMAGERY OF SHUTTLE (IRIS). TASK 1, SUMMARY REPORT
Clifford J. Chocol Aug. 1977 31 p refs
(Contract NAS2-9381)
(NASA-CR-152123-Task-1-Summ; MCR-76-564-Task-1-Summ)
Avail: NTIS HC A03/MF A01 CSCL 22B

The feasibility of remote, high-resolution infrared imagery of the Shuttle Orbiter lower surface during entry to obtain accurate measurements of aerodynamic heat transfer was demonstrated. Using available technology, such images can be taken from an existing aircraft/telescope system (the C141 AIRO) with minimum modification or addition of systems. Images with a spatial resolution of 1 m or better and a temperature resolution of 2.5% between temperatures of 800 and 1900 K can be obtained. Data reconstruction techniques can provide a geometrically and radiometrically corrected array on addressable magnetic tape ready for display by NASA. Author

N81-25131*# Martin Marietta Corp., Denver, Colo.
INFRARED IMAGERY OF SHUTTLE (IRIS). TASK 2, SUMMARY REPORT
Clifford J. Chocol Jan. 1978 16 p refs
(Contract NAS2-9381)
(NASA-CR-152123-Task-2-Summ; MCR-76-564-Task-2-Summ)
Avail: NTIS HC A02/MF A01 CSCL 22B

End-to-end tests of a 16 element indium antimonide sensor array and 10 channels of associated electronic signal processing were completed. Quantitative data were gathered on system

responsivity, frequency response, noise, stray capacitance effects, and sensor paralleling. These tests verify that the temperature accuracies, predicted in the Task 1 study, can be obtained with a very carefully designed electro-optical flight system. Pre-flight and inflight calibration of a high quality are mandatory to obtain these accuracies. Also, optical crosstalk in the array-dewar assembly must be carefully eliminated by its design. Tests of the scaled up tracking system reticle also demonstrate that the predicted tracking system accuracies can be met in the flight system. In addition, improvements in the reticle pattern and electronics are possible, which will reduce the complexity of the flight system and increase tracking accuracy. Author

N81-25132*# Martin Marietta Corp., Denver, Colo.
INFRARED IMAGERY OF SHUTTLE (IRIS). TASK 1 Final Report
Clifford J. Chocol Aug. 1977 151 p refs
(Contract NAS2-9381)
(NASA-CR-152123-Task-1-Final; MCR-76-564-Task-1-Final) Avail: NTIS HC A08/MF A01 CSCL 22B

Assessment of available IR sensor technology showed that the four aerothermodynamic conditions of interest during the entry trajectory of space shuttle can be accommodated by an aircraft flying parallel to the orbiter reentry ground track. Thermal information from the sides of the vehicle can be obtained with degraded performance (temperatures below 800 K) by flying the C-141 aircraft on the opposite side of the shuttle ground track and in the direction opposite that which is optimum for lower surface viewing. An acquisition system using a 6.25-cm aperture telescope and a single indium antimonide detector were designed to meet the acquisition requirements and interface with the 91.5-cm telescope with minimum modification. An image plane system using 600 indium antimonide detectors in two arrays which requires no modification to the existing telescope was also designed. Currently available components were used in a data handling system with interfaces with the experimentors station and the HP2100 computer. A.R.H.

N81-25133*# Martin Marietta Corp., Denver, Colo.
INFRARED IMAGERY OF SHUTTLE (IRIS). TASK 2 Final Report
Clifford J. Chocol Jan. 1978 58 p refs
(Contract NAS2-9381)
(NASA-CR-152123-Task-2-Final; MCR-76-564-Task-2-Final) Avail: NTIS HC A04/MF A01 CSCL 22B

An opto-electronic breadboard of 10 channels of the IR temperature measuring system was produced as well as a scaled up portion of the tracking system reticle in order to verify Task 1 assumptions. The breadboards and the tests performed on them are described and both raw and reduced data are presented. Tests show that the electronics portion of the imaging system will provide a dc to 10,000 Hz bandwidth that is flat and contributes no more than 0.4% of full-scale uncertainty to the measurement. Conventional packaging is adequate for the transresistance amplifier design. Measurement errors expected from all sources tested are discussed. A.R.H.

N81-25134*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE SHUTTLE
1 Apr. 1976 14 p
(NASA-TM-82362) Avail: NTIS HC A02/MF A01 CSCL 22B

The design of the spacecraft is described. Focus is placed on the external tanks, the solid rocket boosters, the main engine, and the space shuttle orbiter. The logistics of the project were reviewed and included the management plan, the facilities involved in construction and testing of the space shuttle, and the benefits expected from the project. T.M.

N81-25135*# Vought Corp., Dallas, Tex.
AUGMENTED ORBITER HEAT REJECTION STUDY Final Report
C. W. Hixon 18 Feb. 1981 132 p
(Contract NAS9-14907)
(NASA-CR-160992; Rept-2-53020/1R-52679) Avail: NTIS HC A07/MF A01 CSCL 22B

Spacecraft radiator concepts are presented that relieve attitude restrictions required by the shuttle orbiter space radiator for baseline and extended capability STS missions. Cost effective heat rejection kits are considered which add additional capability in the form of attached spacelab radiators or a deployable radiator module. T.M.

N81-25136# Institute for Defense Analyses, Arlington, Va.
CONTINUING ISSUES (FY 1980) CONCERNING MILITARY USE OF THE SPACE TRANSPORTATION SYSTEM Final Report, Oct. 1979 - Sep. 1980
Reinald G. Finke, Charles J. Donlan, and George W. Brady Dec. 1980 91 p refs
(Contract MDA903-79-C-0018)
(AD-A098475; IDA-P-1531) Avail: NTIS HC A05/MF A01 CSCL 22/2

The purpose of this study was to continue examination of DoD issues concerning military use of the Space Transportation System. Current issues are in the areas of Shuttle performance, spacecraft and Shuttle ground handling in the operational phase, Shuttle survivability, DoD space experiments and the use of man, advanced space technology and Shuttle launch costs. Principal findings in each of these areas were the following: (A) Shuttle performance. NASA is defining plans regarding means for improving the Shuttle performance to remedy by mid-1986 a payload deficiency of about 8000 lb for the Performance Reference Mission 4. While most of the planning activity to date has been devoted to examining thrust augmentation by addition to auxiliary solid or liquid rocket propulsion units, a number of other feasible options exist which involve modifying or uprating the present components of the Shuttle. A consensus of sources indicated that, if initial funding is committed in FY 1982 and suitable resources are applied to implementing enough of the options, NASA could produce the desired Mission 4 performance in time without resorting to thrust augmentation. (B) Shuttle operational considerations. Ground handling of spacecraft and the Shuttle, and the required logistics support in the operational phase, must be defined to enable the Shuttle to achieve a flight rate allowing timely launch of military payloads without compromising other users: scheduling requirements. Removal of payload checkout from the pad to an off-line payload processing facility has transferred the concern to the Shuttle launch rate capability. GRA

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N81-25137*# Astro Research Corp., Carpinteria, Calif.
CONCEPTUAL DESIGN STUDIES FOR LARGE FREE-FLYING SOLAR-REFLECTOR SPACECRAFT
John M. Hedgepeth, Richard K. Miller, and Karl pop Washington Knapp NASA Jun. 1981 125 p refs

(Contract NAS1-15347)
(NASA-CR-3438; ARC-R-1015) Avail: NTIS HC A06/MF A01 CSCL 22B

The 1 km diameter reflecting film surface is supported by a lightweight structure which may be automatically deployed after launch in the Space Shuttle. A twin rotor, control moment gyroscope, with deployable rotors, is included as a primary control actuator. The vehicle has a total specific mass of less than 12 g/sq m including allowances for all required subsystems. The structural elements were sized to accommodate the loads of a typical SOLARES type mission where a swarm of these free flying satellites is employed to concentrate sunlight on a number of energy conversion stations on the ground. T.M.

N81-25138*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

PITFALLS AND GUIDELINES FOR THE NUMERICAL EVALUATION OF MODERATE-ORDER SYSTEM FREQUENCY RESPONSE

Harold P. Frisch Jun. 1981 36 p refs
(NASA-TP-1814) Avail: NTIS HC A03/MF 01 CSCL 22C

The design and evaluation of a feedback control system via frequency response methods relies heavily upon numerical methods. In application, one can usually develop low order simulation models which for the most part are devoid of numerical problems. However, when complex feedback interactions, for example, between instrument control systems and their flexible mounting structure, must be evaluated, simulation models become moderate to large order and numerical problems become common. A large body of relevant numerical error analysis literature is summarized in a large language understandable to nonspecialists. The intent is to provide engineers using simulation models with an engineering feel for potential numerical problems without getting intertwined in the complexities of the associated mathematical theory. Guidelines are also provided by suggesting alternate state of the art methods which have good numerical evaluation characteristics. T.M.

N81-25139*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

TIME AND FREQUENCY DOMAIN ANALYSIS OF SAMPLED DATA CONTROLLERS VIA MIXED OPERATION EQUATIONS

Harold P. Frisch Jun. 1981 25 p refs
(NASA-TP-1817) Avail: NTIS HC A02/MF A01 CSCL 22B

Specification of the mathematical equations required to define the dynamic response of a linear continuous plant, subject to sampled data control, is complicated by the fact that the digital components of the control system cannot be modeled via linear ordinary differential equations. This complication can be overcome by introducing two new mathematical operations; namely, the operation of zero order hold and digial delay. It is shown that by direct utilization of these operations, a set of linear mixed operation equations can be written and used to define the dynamic response characteristics of the controlled system. It also is shown how these linear mixed operation equations lead, in an automatable manner, directly to a set of finite difference equations which are in a format compatible with follow on time and frequency domain analysis methods. T.M.

N81-25140*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

REDUCED ORDER FEEDBACK CONTROL EQUATIONS FOR LINEAR TIME AND FREQUENCY DOMAIN ANALYSIS

Harold P. Frisch Jun. 1981 27 p refs
(NASA-TP-1818) Avail: NTIS HC A03/MF A01 CSCL 22B

An algorithm was developed which can be used to obtain the equations. In a more general context, the algorithm computes a real nonsingular similarity transformation matrix which reduces a real nonsymmetric matrix to block diagonal form, each block of which is a real quasi upper triangular matrix. The algorithm works with both defective and derogatory matrices and when and if it fails, the resultant output can be used as a guide for the reformulation of the mathematical equations that lead up to the ill conditioned matrix which could not be block diagonalized. T.M.

N81-25141*# Boeing Aerospace Co., Seattle, Wash.

DESIGN, FABRICATION AND TEST OF GRAPHITE/POLYIMIDE COMPOSITE JOINTS AND ATTACHMENTS FOR ADVANCED AEROSPACE VEHICLES Quarterly Technical Progress Report, 1 May - 30 Nov. 1980

D. L. Barclay 15 Dec. 1980 77 p refs
(Contract NAS1-15644)
(NASA-CR-159113; QTPR-6) Avail: NTIS HC A05/MF A01 CSCL 22B

Results of an experimental program to develop several types of graphite/polyimide (GR/PI) bonded and bolted joints for lightly loaded flight components for advanced space transportation systems and high speed aircraft are presented. Tasks accomplished include: a literature survey; design of static discriminator specimens; design allowables testing; fabrication of test panels and specimens; small specimen testing; and standard joint testing. Detail designs of static discriminator specimens for each of the four major attachment types are presented. Test results are given for the following: (1) transverse tension of Celion 3000/PMR-15 laminate; (2) net tension of a laminate for both a loaded and unloaded bolt hole; (3) comparative testing of bonded and co-cured doublers along with pull-off tests of single and double bonded angles; (4) single lap shear tests, transverse tension and coefficient of thermal expansion tests of A7F (LARC-13 amide-imide modified) adhesive; and (5) tension tests of standard single lap, double lap, and symmetric step lap bonded joints. Also, included are results of a finite element analysis of a single lap bonded composite joint. J.M.S.

N81-25142*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

MULTIWALL TPS: AN EMERGING CONCEPT

John L. Shideler, H. Neale Kelly, Don E. Avery, Max L. Blosser, and Howard M. Adelman May 1981 10 p refs Presented at the AIAA Structural Dyn. Specialists Meeting, Atlanta, 9-10 Apr. 1981
(NASA-TM-83133) Avail: NTIS HC A02/MF A01 CSCL 22B

The transformation of a titanium multiwall thermal protection system from a conceptual design to a working reality is described. The thermal and structural performance of the basic multiwall concept is analyzed. Radiant heat, wind tunnel, vibration, acoustic, and lightning strike tests are used to verify the performance of multiwall tiles under representative operating conditions. Flat, all titanium multiwall configurations limited to temperature below 810 K are discussed. Curved surface, higher temperature versions of the multiwall are considered. Preliminary mass estimates for advanced multiwall concepts are presented. J.D.H.

N81-25143*# Vigyan Research Associates, Inc., Hampton, Va.

A CONTROLLER DESIGN APPROACH FOR LARGE FLEXIBLE SPACE STRUCTURES Final Report, 22 Feb. 1980 - 30 Apr. 1981

S. M. Joshi May 1981 53 p refs
(Contract NAS1-16126)
(NASA-CR-165717) Avail: NTIS HC A04/MF A01 CSCL 22B

A controller design approach for large space structures is presented, which consists of a primary attitude controller and a secondary or damping enhancement controller. The secondary controller, which uses several Annular Momentum Control Device (AMCD's), is shown to make the closed loop system asymptotically stable under relatively simple conditions. The primary controller using torque actuators (or AMCD's) and colocated attitude and rate sensors is shown to be stable. It is shown that the same AMCD's can be used for simultaneous actuation of primary and secondary controllers. Numerical results are obtained for a large, thin, completely free plate model. Author

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N81-25144*# Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.

ION AND ADVANCED ELECTRIC THRUSTER RESEARCH Annual Report, 1 Dec. 1979 - 1 Dec. 1980

Paul J. Wilbur Dec. 1980 137 p refs

(Grant NGR-06-002-112)

(NASA-CR-165253) Avail: NTIS HC A07/MF A01 CSCL 21C

A phenomenological model of the orificed, hollow cathode based on the field enhanced, thermionic mechanism of electron emission is presented. High frequency oscillations associated with the orificed, hollow cathode are shown to be a consequence of current flow through the cathode orifice. A procedure for Langmuir probing of the hollow cathode discharge and analyzing the resulting probe characteristics is discussed. The results of sputter yield measurements made for molybdenum, tantalum, type 304 stainless steel and copper surfaces being bombarded by low energy argon or mercury ions are also given. The effects of nitrogen and alternated copper layers on the sputter yields of molybdenum, tantalum and 304 stainless steel are also discussed. A dynamic model of electrothermal rocket and ramjet thrusters is developed. The gross performance of these devices is compared to that of an electromagnetic gun for the case of a high acceleration, Earth launch mission. The theoretical performance of electrothermal rockets and ramjets is shown to be comparable to that of the electromagnetic gun. R.C.T.

N81-25145# Ogden Air Logistics Center, Hill AFB, Utah. Propellant Lab. Section.

SURVEILLANCE REPORT, STAGE 1, DISSECTED MOTORS, PHASE 12: PROPELLANT AND COMPONENT TESTING Semiannual Report

John A. Thompson Jan. 1981 100 p

(AD-A098409; MAKPH-452-81) Avail: NTIS HC A05/MF A01 CSCL 21/9

Testing was performed to determine the useful shelf/service life for LGM-30 Stage 1 Rocket Motors. A three year storage program for propellant and components was started in May 1961, extended to a ten year study, and later continued indefinitely to assure that a deterioration in motor physical characteristics could be detected in time to take some corrective actions before the weapon system performance deteriorated below an acceptable level. This report covers only propellant data and limited case bond data. Separate analyses were made on the respective motors and block propellant for the second time and are shown in the regressions. The plotting symbols for each motor and block propellant are listed in the statistical analyses section. GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

No abstracts in this category.

24 COMPOSITE MATERIALS

Includes laminates.

N81-25146# North Carolina State Univ., Raleigh.

A BROAD-LINE NMR INVESTIGATION OF WATER ABSORBED BY CURED EPOXY RESIN GRAPHITE-FIBER COMPOSITE MATERIALS M.S. Thesis

Robert T. Fuller 1980 78 p refs

Avail: NTIS HC A05/MF A01

The affect of water absorption on the mechanical properties of epoxy resin-graphite fiber composites was investigated. Data collected from nuclear magnetic resonance spectra were used to determine three things: (1) the state of the water in the bulk resin and how tightly the water is bound; (2) if the water in the composite is being absorbed primarily in the matrix or in the interstitial sites between the fibers and the matrix; and (3) how and where the absorption is occurring, and if the water is indeed being absorbed in the matrix. It is shown how this information can be useful in designing resins and composite systems that are free of the problems of degradation due to water absorption. R.C.T.

N81-25147*# Ciba-Geigy Corp., Ardsley, N.Y. P/A Research Lab.

DEVELOPMENT OF NEW ADDITION-TYPE COMPOSITE RESINS Final Report

R. J. Kray Washington NASA Apr. 1981 164 p refs

(Contract NAS1-13703)

(NASA-CR-3276) Avail: NTIS HC A08/MF A01 CSCL 11D

The most promising of a number of new addition type polyimides and polyaromatic melamine (NCNS) resins for use in high performance composite materials. Three different cure temperature ranges were of interest: 530-560 K (500-550 F), 475-530 K (400-500 F), and 450 K (350 F). Examined were a wide variety of polyimide precursors terminated with 5 norbornene groups and addition polymerized at 560 K similar to PMR-15 and LARC-160 polyimides. In addition, a number of lower curing cinnamal end capped polyimides and a bismaleimide were investigated but were not found promising. A group of NCNS resins were investigated and some were found to be superior to current epoxy resins in moisture resistance, oxidative aging and flame and smoke properties. Author

N81-25148*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TUNGSTEN FIBER REINFORCED SUPERALLOYS: A STATUS REVIEW

Donald W. Petrasek and Robert A. Signorelli 1981 70 p refs Presented at the 5th Ann. Conf. on Composites and Advan. Ceram. Mater., Merritt Island, Fla., 18-22 Jan. 1981; sponsored by the American Ceramic Society

(NASA-TM-82590; E-837) Avail: NTIS HC A04/MF A01 CSCL 11D

Improved performance of heat engines is largely dependent upon maximum cycle temperatures. Tungsten fiber reinforced superalloys (TFRS) are the first of a family of high temperature composites that offer the potential for significantly raising hot component operating temperatures and thus leading to improved heat engine performance. This status review of TFRS research emphasizes the promising property data developed to date, the status of TFRS composite airfoil fabrication technology, and the areas requiring more attention to assure their applicability to hot section components of aircraft gas turbine engines. Author

N81-25149*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NONLINEAR LAMINATE ANALYSIS FOR METAL MATRIX FIBER COMPOSITES
C. C. Chamis and J. H. Sinclair 1981 18 p refs Presented at the 22d Structural Dyn. and Mater. Conf., Atlanta 6-8 Apr. 1981; sponsored by AIAA; ASME; American Society of Civil Engineers and AHS
(NASA-TM-82596; E-763) Avail: NTIS HC A02/MF A01 CSCL 11D

A nonlinear laminate analysis is described for predicting the mechanical behavior (stress-strain relationships) of angleplied laminates in which the matrix is strained nonlinearly by both the residual stress and the mechanical load and in which additional nonlinearities are induced due to progressive fiber fractures and ply relative rotations. The nonlinear laminate analysis (NLA) is based on linear composite mechanics and a piece wise linear laminate analysis to handle the nonlinear responses. Results obtained by using this nonlinear analysis on boron fiber/aluminum matrix angleplied laminates agree well with experimental data. The results shown illustrate the in situ ply stress-strain behavior and synergistic strength enhancement. Author

N81-25150*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OXIDATION-INDUCED CONTRACTION AND STRENGTHENING OF BORON FIBERS
James A. DiCarlo and Timothy C. Wagner 1981 35 p refs Presented at the 5th Ann. Conf. on Composites and Advanced Mater., Merritt Island, Fla., 18-22 Jan. 1981; sponsored by the American Ceramic Society
(NASA-TM-82599; E-846) Avail: NTIS HC A03/MF A01 CSCL 11D

An investigation was conducted to measure and understand the physical and mechanical effects that occur in boron fibers during and after thermal treatment in a controlled oxygen argon gaseous mixture. Of principal concern was the optimization of this treatment as a secondary processing method for significantly improving fiber tensile strength. Strengthening was accomplished by an oxidation induced axial contraction of the fiber and a resulting axial compression of strength limiting flaws within the fiber's tungsten boride core. Various physical observations were used to develop mechanistic models for oxidation, contraction, and flow formation. Processing guidelines are discussed for possibly exceeding the 5.5 GN/sq m strength limit and also for achieving fiber strengthening during application of boron containing diffusion barrier coatings. E.D.K.

N81-25151*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPUTER CODE FOR INTRAPLY HYBRID COMPOSITE DESIGN
C. C. Chamis and J. H. Sinclair 1981 15 p refs Presented at the 5th Conf. on Fibrous Composites in Struct. Design, New Orleans, 27-29 Jan. 1981; sponsored by DOD and NASA
(NASA-TM-82593; E-841) Avail: NTIS HC A02/MF A01 CSCL 11D

A computer program is described for intraply hybrid composite design (INHYD). The program includes several composite micromechanics theories, intraply hybrid composite theories, and a hygrothermomechanical theory. These theories provide INHYD with considerable flexibility and capability which the user can exercise through several available options. Key features and capabilities of INHYD are illustrated through selected samples. E.D.K.

N81-25152*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MODIFICATION OF SILICON CARBIDE FIBERS FOR USE IN SiC/Ti COMPOSITES
H. S. Landis (George Washington Univ.), J. Unman (Virginia Polytechnic Inst.), W. D. Brewer, and S. V. N. Naidu (Virginia Polytechnic Inst.) Apr. 1981 18 p refs
(NASA-TM-83122) Avail: NTIS HC A02/MF A01 CSCL 11D

The degradation of silicon carbide fibers during exposure to conditions typical of composite fabrication was investigated. The tensile strength of pristine fibers and fibers sputtered with thin metal coatings were determined before and after treatment at 870 C for one hour in vacuum. Each fiber strength distribution was related by an analytical procedure to a projected composite ultimate tensile strength (PC UTS). The results indicate that a thin aluminum diffusion barrier can yield a 150 percent increase in PC UTS over the baseline SiC/Ti system. Author

N81-25153# Illinois Univ. at Chicago Circle, Chicago. Dept. of Materials Engineering.
STRESS ANALYSIS OF COMPOSITES Final Report, Aug. 1979 - Aug. 1980
R. L. Spilker and T. C. T. Ting Jan. 1981 244 p refs
(Contract DAAG29-79-C-0045; DA Proj. 8X3-63304-D-215)
(AD-A098683; AMMRC-TR-81-5) Avail: NTIS HC A11/MF A01 CSCL 11/4

In the static analysis, the hybrid-stress finite element model is used for (1) the study of edge effects in symmetrically-stacked laminates subject to prescribed inplane strain, (2) the development and evaluation of 8-node single-layer plate bending elements for which the traction-free conditions are satisfied along a straight edge, and (3) the elastic-plastic analysis of single layer plates. An analytic study is also presented to determine the nature of the potential 2-D singularity at the intersection of a bimaterial interface and a free edge. In the dynamic analysis, the stress response in a laminated composite due to a unit step load applied at the boundary is obtained for points which are (a) at a finite distance, and (b) at a large distance, from the impact end. For the case (a), the composite may consist of a finite number of layers. Author (GRA)

N81-25154# Aeronautical Research Labs., Melbourne (Australia).
STATIC BENDING TESTS ON GRP-VINYL FOAM SANDWICH BEAMS
P. H. Townshend Oct. 1980 23 p refs
(AD-A098339; ARL/STRUC-TM-324) Avail: NTIS HC A02/MF A01 CSCL 11/9

Static bending tests were made on three beams of glass reinforced plastic (GRP) and rigid vinyl foam sandwich in order to determine their bending strengths and modes of failure. The static strength data was also required to establish load levels for subsequent bending fatigue tests on this type of sandwich construction which the Royal Australian Navy proposes to use for a catamaran minehunter. Author (GRA)

N81-25155# Army Materials and Mechanics Research Center, Watertown, Mass.
TERMINAL BALLISTICS OF STEEL/ALUMINUM COMPOSITES. PART 1: CALIBER .30 AP STUDY Final Report
Eugenio DeLuca Jan. 1981 29 p
(DA Proj. 1L1-62105-AH-84)
(AD-A098392; AMMRC-TR-81-3-Pt-1) Avail: NTIS HC A03/MF A01 CSCL 19/4

The small caliber AP ballistic performance of two hardened 4300 series alloy steels is studied. Both alloys satisfy specification AMS 6359C for aircraft-quality steel plate, except one has a modified carbon content of 0.46 to 0.48 weight percent; AMS 6359C specifies a carbon content of 0.38 to 0.43. The AMS 6359C alloy is tested in monolithic plate form; the higher carbon alloy is tested as frontal plate in steel/aluminum laminate designs. Steel/aluminum composites of modified 4340 alloy steel heat treated to a hardness level of HRC 55 to 60 and backed with armor grade 5083 aluminum are tested with the caliber .30 AP M2 projectile. Limit velocity data is generated for composites of unit weight 13.5 to 20 lb/sq ft and variable weight fraction steel. Ballistic tests are conducted both at ambient conditions and subzero temperature. Comparative limit velocity data is generated with the caliber .30 AP M2 projectile for monolithic plates of AMS 6359C 4340 steel hardened to HRC 50 to 55 and current production high-hardness steel (MIL-A-46100).
Author (GRA)

N81-25156# Oak Ridge National Lab., Tenn. Engineering Analysis Dept.
APPLICATION OF WEIBULL CRITERION TO FAILURE PREDICTION IN COMPOSITES
W. D. Cain and C. E. Knight, Jr. (Virginia Polytechnic Inst. and State Univ.) 20 Apr. 1981 17 p refs

(Contract W-7405-eng-26)
(Y-2235) Avail: NTIS HC A02/MF A01

The Weibull statistical failure theory, widely used for failure prediction in ceramic components, is applied to predicting failure of a generally loaded fiber composite material. An examination of the general form of the Weibull criterion, evaluation of the parameters, and scaling of the parameter values are included. An integral form is presented which can be used in a finite element code to predict structural failure. Composite strand and ring test data are shown to be representable by a two parameter Weibull model. E.D.K.

N81-25157# Dartmouth Coll., Hanover, N.H. Dept. of Physics and Astronomy.
SUPERCONDUCTIVITY IN FILAMENTARY EUTECTIC COMPOSITES Progress Report, 1 Jun. 1980 - 31 May 1981
Mark P. Zaitlin 1981 12 p refs
(Contract DE-AS02-78ER-04938)
(COO-4938-4; DOE/ER-04938/T1) Avail: NTIS HC A02/MF A01

The ac magnetic susceptibility of the Nb-Th eutectic composites in a dc magnetic field showed the existence of a mixed state in the thorium matrix material even in large fields of several kilogauss. This mixed state persisted until nearly the field at which superconductivity in the niobium filaments was destroyed. Measurements of the upper critical field H(sub c2) were independent of filament diameter and showed less anistropy than expected. The upper critical field was nearly linear in T(sub c)-T which is indicative of an anisotropic Fermi surface. The ac susceptibility measurements could not be used to find the lower critical field H(sub c1) because the mixed state gave the sample too short a skin depth. DOE

N81-25158# Kernforschungszentrum, Karlsruhe (West Germany).
INVESTIGATION OF SOME PHYSICAL AND MECHANICAL PROPERTIES OF TITANIUM CARBIDES AND OF COMPLEX
T. A. Emelyanova, V. I. Mashevskaya, G. G. Travushkin, and G. A. Vishnyakova Jun. 1980 8 p refs In GERMAN
(KFK-TR-645) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The strength, hardness, elasticity as well as the destruction characteristics of titanium carbide and carbide mixed crystals (Ti, Mo) C are investigated. The investigation is connected with the necessity to choose the composition and the production method of the carbides for hard metals free of tungsten. DOE

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N81-25159* National Aeronautics and Space Administration. Pasadena Office, Calif.
STARK EFFECT SPECTROPHONE FOR CONTINUOUS ABSORPTION SPECTRA MONITORING Patent
Michael J. Kavaya, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 3 Mar. 1981 7 p Filed 30 May 1980 Supersedes N80-25538 (18 - 16, p 2116) Sponsored by NASA
(NASA-Case-NPO-15102-1; US-Patent-4,253,769; US-Patent-Appl-SN-154726; US-Patent-Class-356-432; US-Patent-Class-250-350) Avail: US Patent and Trademark Office CSCL 07D

A Stark effect spectrophone using a pulsed or continuous wave laser having a beam with one or more absorption lines of a constituent of an unknown gas is described. The laser beam is directed through windows of a closed cell while the unknown gas to be modified flows continuously through the cell between electric field plates disposed in the cell on opposite sides of the beam path through the cell. When the beam is pulsed, energy absorbed by the gas increases at each point along the beam path according to the spectral lines of the constituents of the gas for the particular field strengths at those points. The pressure measurement at each point during each pulse of energy yields a plot of absorption as a function of electric field for simultaneous detection of the gas constituents. Provision for signal averaging and modulation is included.

Official Gazette of the U.S. Patent and Trademark Office

N81-25160 Utah Univ., Salt Lake City.
TEMPERATURE DEPENDENCE OF QUENCHING OF MAGNESIUM METASTABLES BY HYDROGEN AND INITIAL DISTRIBUTIONS AND BRANCHING RATIOS FROM HYDROGEN AND DEUTERIUM QUENCHING OF CADMIUM SINGLET Ph.D. Thesis
William Louis Nikolai, III 1981 138 p
Avail: Univ. Microfilms Order No. 8109564

The temperature dependence of the rate constant for the quenching of Mg(3s 3p 3Pj) by H2 was determined using laser excited fluorescence over the range 612 to 814 K. A low temperature determination and the results of these experiments fit a simple equation which includes terms for E to V,R energy transfer. There is apparently no activation barrier to reaction beyond the 11.5 kcal/mole endothermicity of the reaction. The Cd(5s 5p 3Pj) initial distributions Cd(3P2):Cd(3P1):Cd(3P0), were measured for the spin forbidden process. Branching ratios for this process were determined for H2, D2 and CO. The technique used is a powerful laser induced fluorescence pump and probe method that permits determination of state to state reaction dynamics under 'bulb' rather than 'beam' pressures by substituting fast detection of products for low reactant pressures.

Dissert. Abstr.

N81-25161 Utah Univ., Salt Lake City.
INTERPRETATION TECHNIQUES FOR MULTIDIMENSIONAL DATA SETS Ph.D. Thesis
Fritz John Knorr 1981 140 p
Avail: Univ. Microfilms Order No. 8109569

Methods are developed for the interpretation of data sets from analytical techniques which resolve chemical information along two axes simultaneously thus given results in the form of matrices. A method based on a factor analysis approach is developed for determining the mass spectra and concentrations of individual components from data sets resulting from unknown, concentration modulated mixtures. A reiterative matrix modeling procedure is presented for determining the individual spectra of fluorescent mixtures observed with time and emission wavelength resolved emission spectroscopy. Dissert. Abstr.

N81-25162 Minnesota Univ., Minneapolis.
MAGNESIUM-25 NUCLEAR MAGNETIC RESONANCE AS A PROBE OF METAL ION INTERACTIONS WITH BIOLOGICAL MACROMOLECULES Ph.D. Thesis
Deni Murk Rose 1980 209 p
Avail: Univ. Microfilms Order No. 8109504

A brief study of magnesium 25 nuclear relaxation in aqueous electrolyte solutions confirms the dominant contribution of the nuclear electric quadrupole interaction to magnesium 25 NMR relaxation. Longitudinal and transverse relaxation rates are shown to be equal for magnesium chloride solutions in the concentration range of 0.1 to 5.0 molal, and there is no observed relaxation effect from magnesium 25 scalar coupling to the oxygen 17 nuclei of the first coordination sphere water molecules. In aqueous solutions containing equal concentrations of ethylenediaminetetraacetic acid, the magnesium 25 NMR spectrum is shown to vary with pH. The effects of binding of magnesium ions by bovine serum albumin are observed in the dependence of the magnesium 25 NMR line width on total magnesium concentration and temperature in aqueous solutions of BSA. Magnesium 25 NMR investigations of cation DNA interactions are discussed in terms of the ion condensation model of counterion polyelectrolyte association. Dissert. Abstr.

N81-25163 Illinois Univ. at Urbana-Champaign.
OPTICAL AND ELECTRONIC ASPECTS OF AUTOMATING A SPECTROFLUOROMETRIC/LIQUID CHROMATOGRAPHIC SYSTEM Ph.D. Thesis

John William Lyons 1980 312 p
Avail: Univ. Microfilms Order No. 8108591

The techniques of liquid chromatography and spectrofluorometry were combined to facilitate qualitative analysis of multicomponent fluorescent mixtures. Electronic hardware was developed so that instrument control and data collection could be automated. The optical design of the fluorometric system and the high levels of scattered light inherent in the small volume flow cells used to preserve the resolution of chromatographic effluents were of particular interest. A computer program based on the matrix methods of Gaussian optics was developed to determine the positions of the elements of the detection system so as to maximize its throughput. Ray tracing algorithms were developed in an investigation of the production of scattered light caused by reflection and refraction. The investigation showed that the use of double monochromators in both the exitation and emission systems and proper cell selection are the most important methods of scattered light reduction when temporal rejection is not possible. Dissert. Abstr.

N81-25164 Illinois Univ. at Urbana-Champaign.
STRUCTURAL CHARACTERIZATION OF LIQUID-CHROMATOGRAPHIC EFFLUENTS VIA REVERSE FILE-SEARCHING OF FLUORESCENCE SPECTRA Ph.D. Thesis
Patrick Thomas Hardesty 1980 254 p
Avail: Univ. Microfilms Order No. 8108523

The technique operates by separating mixture components in a liquid chromatograph and submitting them sequentially to a high performance spectrofluorometer for spectra characterization. The excitation and emission fluorescence spectra are searched against a library containing more than 1150 compounds, by an algorithm which compares spectral similarity from the point of view of both the unknown spectrum and the library spectrum, thus combining the best features of forward and reverse searching. Dissert. Abstr.

N81-25165 Illinois Univ. at Urbana-Champaign.
DEVELOPMENT OF A MODEL SYSTEM OF ELECTROGENERATED CHEMILUMINESCENCE STUDIES Ph.D. Thesis
Robert Scott Glass 1980 218 p
Avail: Univ. Microfilms Order No. 8108520

In general, an electron transfer reaction that is sufficiently energetic to produce the emitting state of a product is expected to do so directly. This S route to emission in such energy sufficient systems is quite straightforward. On the other hand, many systems are known in which the electron transfer is insufficiently energetic to leave a product in the observed emitting state. These energy deficient cases are usually regarded as proceeding to emission by producing triplet intermediates in electron transfer, then generating the emitters by triplet-triplet annihilation (T route). The principal kinetic tool for studying ECL, has repeatedly given results that are not consistent with this picture. Thus, there is strong evidence that the kinetic features of most systems are more complicated than is generally believed. Dissert. Abstr.

N81-25166 California Inst. of Tech., Pasadena.
THERMOCHEMISTRY AND REACTION KINETICS OF DISOLVATED PROTONS BY ION CYCLOTRON RESONANCE SPECTROSCOPY. 1: THERMOCHEMICAL STUDIES OF SMALL FLUOROCARBONS BY PHOTOIONIZATION MASS SPECTROSCOPY. 2 THERMOCHEMICAL STUDIES OF SMALL FLUOROCARBONS BY PHOTOIONIZATION MASS SPECTROMETRY Ph.D. Thesis
D. Wayne Berman 1981 142 p
Avail: Univ. Microfilms Order No. 8109051

The disolvated proton, H(OH2)2(+) is employed as a chemical reagent in low pressure investigations by ion cyclotron resonance spectroscopy. Since thermolecular reactions are absent at low pressure, disolvated protons are not generally observed. However, H(OH2)2(+) is produced in a sequence of bimolecular reactions in mixtures containing H2O and one of a small number of organohalide precursors. A series of hydrated Lewis bases is produced by H3O(+) transfer from H(OH2)2(+). The relative stability of hydrated bases containing heteroatoms of both first and second row elements is determined from the preferred direction of H3O(+) transfer between BH(OH2)(+) complexes. The S and P containing bases are shown to bind H3O(+) more weakly than O and N bases with comparable proton affinities. A simple model of hydrogen bonding is proposed to account for these observations. Dissert. Abstr.

N81-25167# Academy of Sciences (USSR), Moscow. Space Research Inst.
PHENOMENOLOGY OF UNSTABLE COMBUSTION FOR SMALL AND LARGE LEWIS NUMBERS
A. P. Aldushin, B. A. Malomed, and Ya. B. Zeldovich 1980 31 p refs
(Rept-596) Copyright. Avail: Issuing Activity

A general phenomenological method is proposed for analytical description of nonsteady and inhomogeneous regimes of combustion front propagation. The method is based on representation of the front in the form of a distributed active dynamical system. It is shown that development of the self-oscillatory instability of a plane gasless combustion front (small Lewis numbers) results in spin regimes of the cylindrical surface combustion while a periodic instability development of gas or filtration combustion front (large Lewis numbers) results in appearance of stable stationary cellular flame. The formation of cellular flame structures is predicted as a results of the front instability development in a case of parallel reactions as well. R.C.T.

N81-25168*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SYNTHETIC BATTERY CYCLING
Lawrence H. Thaller 1981 13 p refs Proposed for presentation at the 16th Intersoc. Energy Conversion Eng. Conf., Atlanta, 9-14 Aug. 1981; sponsored by the American Society of Mechanical Engineering
(NASA-TM-81757; E-820) Avail: NTIS HC A02/MF A01 CSCL 10C

The use of interactive computer graphics is suggested as an aid in battery system development. Mathematical representations of simplistic but fully representative functions of many electrochemical concepts of current practical interest will permit battery level charge and discharge phenomena to be analyzed in a qualitative manner prior to the assembly and testing of actual hardware. This technique is a useful addition to the variety of tools available to the battery system designer as he bridges the gap between interesting single cell life test data and reliable energy storage subsystems. E.D.K.

N81-25169*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Polymer Materials and Interfaces Lab.
SYNTHESIS AND CHARACTERISTICS OF POLYARYLENE ETHER SULFONES Final Report
R. Viswanathan, B. C. Johnson, T. C. Ward, and J. E. McGrath May 1981 316 p refs
(Grant NsG-1599)
(NASA-CR-164436) Avail: NTIS HC A14/MF A01 CSCL 07D

A method utilizing potassium carbonate/dimethyl acetamide, as base and solvent respectively, was used for the synthesis of several homopolymers and copolymers derived from various bisphenols. It is demonstrated that this method deviates from simple second order kinetics; this deviation being due to the heterogeneous nature of the reaction. Also, it is shown that a liquid induced crystallization process can improve the solvent resistance of these polymers. Finally, a Monte Carlo simulation of the triad distribution of monomers in nonequilibrium copolycondensation is discussed. M.G.

N81-25170*# United Technologies Corp., South Windsor, Conn. Power Systems Div.
COST PROJECTIONS FOR REDOX ENERGY STORAGE SYSTEMS Final Report, 30 Apr. - 30 Sep. 1979
Kenneth Michaels and Gene Hall Feb. 1980 97 p refs
(Contracts DEN3-126; DE-AI04-80AL-12726)
(NASA-CR-165260; DOE/NASA/0126-1; FRC-1784) Avail: NTIS HC A05/MF A01 CSCL 10C

A preliminary design and system cost analysis was performed for the redox energy storage system. A conceptual design and cost estimate was prepared for each of two energy applications: (1) electric utility 100-MWh requirement (10-MW for ten hours) for energy storage for utility load leveling application, and (2) a 500-kWh requirement (10-kW for 50 hours) for use with a variety

of residential or commercial applications, including stand alone solar photovoltaic systems. The conceptual designs were based on cell performance levels, system design parameters, and special material costs. These data were combined with estimated thermodynamic and hydraulic analysis to provide preliminary system designs. Results indicate that the redox cell stack to be amenable to mass production techniques with a relatively low material cost. R.C.T.

N81-25171# Colorado State Univ., Fort Collins. Dept. of Chemistry.

TWO PHOTON SPECTROSCOPY OF UF6 IN THE NEAR ULTRAVIOLET

E. R. Bernstein and P. M. Kennedy 10 Mar. 1981 12 p refs Submitted for publication

(Contract N00014-79-C-0647)

(AD-A096396; TR-2) Avail: NTIS HC A02/MF A01 CSCL 07/4

The two photon excited fluorescence excitation spectrum of UF6 was observed in the region 410 to 315 nm. The spectrum was virtually indistinguishable from the one photon absorption in this region. No vibronic structure was observed in absorption or dispersed emission. These data indicate a high density of u and g states for UF6 in this energy range and facile photochemical decomposition. Emission intensity was found to be proportional to laser power to the 3.0 to 3.6 power. Author

N81-25172# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.

EFFECTIVE VISCOSITY OF LIQUID HELIUM4: WITH MINUTE He-3 IMPURITY AT TEMPERATURE FROM 0.05K TO 2K AND AT VELOCITIES SPANNING THE CRITICAL VELOCITIES Final Report

Robert C. Pandorf Mar. 1981 245 p refs

(Contract N00014-77-C-0295)

(AD-A098733; R-1403; ONR-CR-007-003-1F) Avail: NTIS HC A11/MF A01 CSCL 07/2

A comprehensive theory of the velocity independent effective viscosity of liquid He4 with minute He3 impurity is developed for parallel plate geometry and is found to well represent the experimental measurements. The velocity independent viscosity measurements taken at temperatures above 0.8K were in agreement with the experimental measurements of the coefficient of viscosity made by Woods and Hollis Hallet. As the temperature T was lowered below 1.8K, the viscosity rose rapidly, approaching a T to the minus 9th power temperature dependence. Then below 0.8K the rapid rise quickly diminished. The diminution in the effective viscosity of liquid He4 of high purity is so rapid that it extrapolates to a nearby frictionless fluid at temperatures below 0.1K. GRA

N81-25173# Rocketdyne, Canoga Park, Calif.

INORGANIC HALOGEN OXIDIZER RESEARCH Annual Report, 1 Mar. 1980 - 28 Feb. 1981

K. O. Christe, C. J. Schack, W. W. Wilson, and R. D. Wilson 21 Apr. 1981 169 p refs

(Contract N00014-79-C-0176)

(AD-A098705; RI/RD81-140) Avail: NTIS HC A08/MF A01 CSCL 07/4

Principal areas of investigation included perfluoroammonium salts, halogen fluorides, oxyfluorides, hypofluorites, monofluoramine, and aqueous fluorinations. Force field calculations, structure determinations, low temperature matrix isolation studies, and novel energetic anions are also discussed. GRA

N81-25174# Pennsylvania State Univ., University Park. Dept. of Materials Science and Engineering.

GAS-PHASE CARBON FORMATION RATES AND MECHANISMS UNDER HIGH-TEMPERATURE HYDROCARBON REFORMING CONDITIONS Annual Technical Progress Report, 28 Sep. 1979 - 30 Sep. 1980

J. J. Reuther, H. B. Palmer, K. C. Yiin, and J. J. Warchol Oct. 1980 19 p refs

(Contract DE-AC21-79MC-12736)

(PSU-FCL-C-80-87) Avail: NTIS HC A02/MF A01

Gas phase carbon formation/destruction rates aand mechanisms were determined in high temperature environments produced by a laminar flat flame burner and a turbulent plug flow reactor as a function of fuel, stoichiometry additive/diluent, and at simulated hydrocarbon reformer conditions (approx. 1000-14000 K; approx. 1 atm). Accurate measurements of vapor phase chemical microstructure (stable and free radical species) as a function of global soot formation rates in the well defined systems will provide the information necessary for the identification of the normal mechanism by which soot is produced and the altered mechanism by which soot is suppressed upon addition of diluent or additive. Construction of the subatmospheric pressure flat flame burner facility is now complete and its detailed description is provided. DOE

N81-25175# Illinois Inst. of Tech., Chicago. Dept. of Chemistry.

STUDIES OF COMBUSTION KINETICS AND MECHANISMS

David Gutman 30 Jan. 1981 14 p

(Contract DE-AS02-78ER-14953)

(DOE/ER-14953/1) Avail: NTIS HC A02/MF A01

The current research has two objectives; first, the development of an entirely new method for studying the elementary reactions of polyatomic free radicals, and second, the use of the new method to obtain quantitative information on their reactions which are important in combustion processes. The apparatus needed for these studies was designed, built, tested, and used to study reactions of the C3H5 and CH3 radicals (C3H5 + NO2; C3H5 + Br2; CH3 + NO2). In addition, suitable free radical precursors were searched for future studies. DOE

N81-25176# Yale Univ., New Haven, Conn.

STUDIES OF THE HYDROGENATION OF SMALL UNSATURATED MOLECULES USING ORGANOMETALLIC CLUSTER COMPOUNDS AS CATALYSTS

1981 20 p refs

(Contract DE-AS02-78ER-04900)

(DOE/ER-04900/1) Avail: NTIS HC A02/MF A01

Continued investigations of the reactivity of transition metal hydride cluster compounds with small heteronuclear unsaturated molecules include further elucidation of the mechanisms of hydrogen transfer from metal atoms to unsaturated substrates and studies of the structure and bonding of partially hydrogenated substrates coordinated to polynuclear metal centers. Investigations of the reactivity of the bridging hydride ligand and the chemistry of alkyl groups in clusters are planned as well as the development of heteronuclear clusters as homogeneous CO hydrogenation catalysts. DOE

N81-25177# SRI International Corp., Menlo Park, Calif.

PARAMETERS FOR OZONE PHOTOLYSIS AS A FUNCTION OF TEMPERATURE AT 280-330 NM Final Report, Sep. 1978 - Mar. 1980

John E. Davenport Apr. 1980 41 p refs

(Contract DOT-FA78WA-4263)

(AD-A097775; FAA-EE-80-44) Avail: NTIS HC A03/MF A01 CSCL 07/5

The parameters for ozone photolysis in the 280-330 nm region were obtained as a function of temperature in the 200-300 K range. The absolute absorption coefficients for 03 were measured at 298, 271k 225, and 206 K and were tabulated at 1 nm intervals over the 250-270 nm wavelength range. Uncertainties in the absorption coefficients ranged from 2% at room temperature to about 14% at 206 K and mainly fall in the 3-7% range. Pressure of 0.02-100 torr ozone were used, and no pressure effect was observed up to 800 torr N2. The relative O(1D) quantum yield resulting from laser pulse photolysis of ozone was measured at 300, 260, and 198 K, in the 280-310 nm region by direct observation of the O(1D) fluorescence at 630 nm. DOE

N81-25178# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Chemistry.

CATALYTIC OXIDATION OF S(IV) ON ACTIVATED CARBON IN AQUEOUS SUSPENSION: KINETICS AND MECHANISM Ph.D. Thesis

Richard Brodzinsky Feb. 1981 85 p

(Contract W-7405-eng-48)

(LBL-12218) Avail: NTIS HC A05/MF A01

Activated carbon and combustion produced soot particles were studied for their catalytic effect on the oxidation of aqueous

sulfur(IV) species. Detailed kinetic studies of the reaction were performed on three different activated carbons and on a soot collected in a highway tunnel. Combustion produced soots were tested for their catalytic behavior and found to be similar to the activated carbons. The reaction rate was found to be linearly dependent on the concentration of carbon particles in the solution. The rate was found to follow a Langmuir adsorption isotherm for its dependence on oxygen and the product of two adsorption isotherms for S(IV). DOE

N81-25179# Oak Ridge National Lab., Tenn. Computer Sciences Div.

MODELING OF PHASE-CHANGE PROCESSES WITH TIME-VARYING CRITICAL TEMPERATURE

V. Alexiades, A. D. Solomon, and D. G. Wilson Apr. 1981 19 p ref

(Contract W-7405-eng-26)

(ORNL/CSD/TM-145) Avail: NTIS HC A02/MF A01

The posing of two phase, one dimensional, Stefan-like problems is considered when the critical temperature of the phase change is not constant. Several combinations of variable densities, *specific heats and critical temperature are considered. In all but* the last case, when all three may vary, the interface condition has the usual form. However, in this last case the interface *condition involves the whole history of the liquid.* DOE

N81-25180# Kentucky Univ., Lexington. Dept. of Chemical Engineering.

HOT-GAS DESULFURIZATION. VOLUME 2: USE OF GASIFIER ASH IN A FLUIDIZED-BED PROCESS ***Final Report***

J. Thomas Schrodt 1 Feb. 1981 329 p refs

(Contract DE-AS05-76ET-10463)

(DOE/ET-10463/T1-Vol-2) Avail: NTIS HC A15/MF A01

Three gasifier coal ashes were used as reactant/sorbents in *batch fluidized beds to remove hydrogen sulfide from hot, made-up* fuel gases. It is predominantly the iron oxide in the ash that reacts with and removes the hydrogen sulfide; the sulfur reappears *in ferrous sulfide. Sulfided ashes were regenerated by hot, fluidizing* streams of oxygen in air; the sulfur is recovered as sulfur dioxide, exclusively. Ash sorption efficiency and sulfur capacity increase *and stabilize after several cycles of use. These two parameters* vary directly with the iron oxide content of the ash and process temperature, but are independent of particle size in the range *0.01 - 0.02 cm. A western Kentucky No. 9 ash containing* 22 weight percent iron as iron oxide sorbed 4.3 weight percent sulfur at 12000 F with an ash sorption efficiency of 0.93 at *ten percent breakthrough. A global, fluidized bed, reaction rate* model was fitted to the data and it was concluded that chemical kinetics is the controlling mechanism with a predicted activation *energy of 19,600 Btu/lb mol. Iron oxide reduction and the water* gas shift reaction were two side reactions that occurred during desulfurization. The regeneration reaction occurred very rapidly *in the fluid bed regime, and it is suspected that mass transfer* is the controlling phenomenon. DOE

N81-25181# *Sandia Labs., Albuquerque, N. Mex.*

MEASUREMENT OF HYDROGEN IN AN ALUMINA CERAMIC BY TOTAL REFLECTION INFRARED SPECTROSCOPY

D. R. Tallant Apr. 1981 14 p refs

(Contract DE-AC04-76DP-00789)

(SAND-81-0132) Avail: NTIS HC A02/MF A01

Ceramics were examined by infrared spectroscopy using a total reflection technique to identify and measure the concentration of hydrogen containing species. Results suggest that the surface of the ceramic does not contain significant adsorbed hydrogen. The observed hydroxyl absorption intensity corresponds to a bulk concentration of about 10 to the 18th power hydrogen ions per cubic centimeter. DOE

N81-25182# Science Applications, Inc., La Jolla, Calif.

APPLICATION OF NUMERICAL SIMULATION METHODOLOGY TO AUTOMOTIVE COMBUSTION ***Progress Report***

Dec. 1980 45 p refs

(Contract DE-AC04-79ET-15397)

(DOE/ET-15397/T3) Avail: NTIS HC A03/MF A01

A numerical simulation methodology was developed for in-cylinder reactive flows in internal combustion engines. The model was used to simulate numerous engine related problems for validation and demonstration purposes. The technical efforts were concentrated on: reactive flow model development; test and data comparison; studies in cylinder compression cycle simulations. R.C.T.

N81-25183# *Sandia Labs., Livermore, Calif. Dept. of Combustion Sciences.*

FUNDAMENTAL COMBUSTION AND DIAGNOSTICS RESEARCH AT SANDIA ***Progress Report, Sep. - Dec. 1980***

D. L. Hartley and M. A. Gusinow, ed. Feb. 1981 64 p refs

(Contract DE-AC04-76DP-00789)

(SAND-81-8206) Avail: NTIS HC A04/MF A01

Several investigations addressing aspects of combustion physics, molecular physics and spectroscopy, and diagnostics are briefly reviewed. DOE

N81-25184# Colorado Univ., Boulder. Dept. of Chemistry.

LASER PHOTOELECTRON SPECTROSCOPY OF IONS ***Progress Report***

G. Barney Ellison 1 Aug. 1981 8 p

(Contract DE-AC02-80ER-10722)

(DOE/ER-10722/T7) Avail: NTIS HC A02/MF A01

A negative ion photoelectron spectrometer is described and representative mass spectra and photodetachment spectra are presented. DOE

N81-25185# *Albany International Corp., Dedham, Mass.*

DEVELOPMENT OF HOLLOW FIBER REVERSE OSMOSIS MEMBRANES Final Report

Daniel K. Schiffer, Robert B. Davis, Myron J. Coplan, and Charles E. Kramer Nov. 1980 40 p

(Contract DI-14-34-0001-9531)

(PB81-167215; W81-01652; OWRT-C-90266-D(9531)(1))

Avail: NTIS HC A03/MF A01 CSCL 07D

Work conducted is a continuation of the development of a *hollow fiber reverse osmosis composite membrane. Five systems* (sulfonated polysulfone, piperazine phthalamide, immobilized zirconium, chemically bound tannins, and direct membrane *formation) were investigated as replacements for the polyfuran* membrane. Sulfonated polysulfone was the most promising and enough membranes were prepared for testing in small module *form at OWRT-Roswell. Testing indicates that SPS is a stable* membrane with tolerance to aggressive feeds, such as 50 C seawater and pH8, 100 ppm active chlorine. GRA

N81-25186# National Bureau of Standards, Washington, D.C. National Measurement Lab.

ION ENERGETICS MEASUREMENTS, PART 1. 1971-1973

H. M. Rosenstock, D. Sims, S. S. Schroyer, and W. J. Webb Sep. 1980 379 p refs Sponsored by National Inst. of General Medical Sciences

(PB81-151474; NSRDS-NBS-63-Pt-1; LC-80-607942) Avail: NTIS HC A17/MF A01 CSCL 07D

Measurement information on energetics of gaseous positive ions published in 1972 and 1973 along with some information from 1971 are tabulated. It is intended to supplement the *information previously compiled and evaluated in 'Energetics of* Gaseous Ions'. Approximately five thousand measurements are tabulated, drawn from over six hundred published papers. GRA

N81-25187# Burns and Roe Industrial Services Corp., Paramus, N. J.

DEVELOPMENT OF IMPROVED CLEANING AND SURFACE REGENERATION METHODS AND ECONOMIC ANALYSIS OF THESE METHODS FOR SEAWATER MEMBRANES

31 Jan. 1981 113 p refs

(Contract DI-14-34-0001-9524)

(PB81-170607; W81-01757; OWRT-C-90183-D(9524)(1))

Avail: NTIS HC A06/MF A01 CSCL 07D

Seawater membranes having deteriorated salt rejection *through partial loss of the desalting layer are regenerated to* approach their initial rejection through the application of chemical agents. The agents include water dispersible resins, surfactants, *other colloids and organic acids. The effectiveness of a regenera-*ting agent is a junction of (1) type of membrane material;

(2) initial level of salt rejection; and (3) flow conditions. At optimum additive concentration, the membrane quality parameter, *square A/B increases. For an agent to sustain its effect for a* long period, it should be capable of some specific interaction with the membrane such as hydrogen bonding. In all cases, it *is cost effective to clean and regenerate rather than replace* modules. However, in some cases, replacement is recommended. GRA

N81-26014# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
COMBUSTION NOISE
Robert Legendre *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-5 (ESA-TT-673) Mar. 1981 p 75-78 Transl. into *ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris)*, no. 1980-5, Sep. - Oct. 1980 p 369-371 (For primary document see N81-26008 16-99)
Avail: NTIS HC A05/MF A01

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N81-25188* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CORROSION RESISTANT THERMAL BARRIER COATING Patent
Stanley R. Levine, Robert A. Miller, and Philip E. Hodge, inventors (to NASA) Issued 10 Mar. 1981 3 p Filed 31 Oct. 1979 Supersedes N80-11142 (18 - 02, p 0160)
(NASA-Case-LEW-13088-1; US-Patent-4,255,495; US-Patent-Appl-SN-089779; US-Patent-Class-428-632; US-Patent-Class-428-471; US-Patent-Class-428-678; US-Patent-Class-428-679; US-Patent-Class-428-680) Avail: US Patent and Trademark Office CSCL 11F

A thermal barrier coating system for protecting metal surfaces at high temperature in normally corrosive environments is described. The thermal barrier coating system includes a metal alloy bond coating, the alloy containing nickel, cobalt, iron, or a combination of these metals. The system further includes a corrosion resistant thermal barrier oxide coating containing at least one alkaline earth silicate. The preferred oxides are calcium silicate, barium silicate, magnesium silicate, or combinations of these silicates.
Official Gazette of the U.S. Patent and Trademark Office

N81-25189*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ION PLATING FOR THE FUTURE
Talivaldis Spalvins 1981 9 p refs Presented at the 24th Ann. Tech. Conf. of the Soc. of Vacuum Coaters, Dearborn, Mich., 12-14 May 1981
(NASA-TM-82630; E-884) Avail: NTIS HC A02/MF A01 CSCL 11F

The ion plating techniques are classified relative to the instrumental set up, evaporation media, and mode of transport. A distinction is drawn between the low vacuum (plasma) and high vacuum (ion beam) techniques. Ion plating technology is discussed at the fundamental and industrial level. At the fundamental level, the capabilities and limitations of the plasma (evaporant flux) and film characteristics are evaluated. And on the industrial level, the performance and potential uses of ion plated films are discussed. Author

N81-25190*# Pittsburg Univ., Pa. Dept. of Metallurgical and Materials Engineering.
INVESTIGATION INTO THE ROLE OF NaCL DEPOSITED ON OXIDE AND METAL SUBSTRATES IN THE INITIATION OF HOT CORROSION Semiannual Report, 1 Oct. 1980 - 1 Apr. 1981
N. Birks 1 Apr. 1981 35 p refs
(Grant NAG3-44)
(NASA-CR-164384; SAR-2) Avail: NTIS HC A03/MF A01 CSCL 11F

The conversion to Na2SO4 of NaCl deposited on oxide substrates was studied as a function of temperature, in air with various SO2 and H2O partial pressures. The substrate was either *a pure oxide or an oxide scale growing on a metal specimen.* The progress of the reaction was observed using the SEM-EDAX technique to monitor morphological effects and, as far as possible, *establish the rate of the process. The physical characteristics of* the interaction between salt and substrate were also examined with particular reference to physical damage to the underlying *oxide, especially when this is a scale on a metal specimen.* An effort was also made to establish the conditions under which liquid phases may form and the *mechanisms by which they form.* A.R.H.

N81-25191*# *National Aeronautics and Space Administration.* Lewis Research Center, Cleveland, Ohio.
HIGH TEMPERATURE ALKALI CORROSION IN HIGH *VELOCITY GASES*
Carl E. Lowell, Steven M. Sidik, and Daniel L. Deadmore May 1981 37 p refs
(Contract EF-77-A-01-2593)
(NASA-TM-82591; DOE/NASA/2593-26; E-838) Avail: NTIS HC A03/MF A01 CSCL 11F

The effects of potential impurities in coal derived liquids such as Na, K, Mg, Ca and Cl on the accelerated corrosion of IN-100, U-700, IN-792 and Mar-M509 were investigated using *a Mach 0.3 burner rig for times to 1000 hours in one hour* cycles. These impurities were injected in combination as aqueous solutions into the combustor of the burner rig. The experimental *matrix utilized* was designed statistically. The extent of corrosion was determined by metal recession. The metal recession data were fitted by linear regression to a polynomial expression which allows both interpolation and extrapolation of the data. As anticipated, corrosion increased rapidly with Na and K, and a marked maximum in the temperature response was noted for many conditions. In contrast, corrosion decreased somewhat as the Ca, Mg and Cl contents increased. Extensive corrosion was observed at concentrations of Na and K as low as 0.1 PPM at long times. Author

N81-25192# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
MECHANICAL PROPERTIES OF ROTARY FORGED SOLID ESR PREFORMS
F. A. Heiser Oct. 1980 54 p
(AD-A094744; AD-E440105; ARLCB-MR-80039) Avail: NTIS HC A04/MF A01 CSCL 13/8

Electro slag refined steel, rotary forged from a solid 20 inch cast ingot into a solid 13 inch diameter cylinder, was evaluated metallographically and mechanically. It is shown that the degree of working is not uniform across the cross section, being greatest near the ID and least near the center. This degree of working manifests itself in the ductility but not in the strength or impact toughness. Normalizing prior to quench and temper lowered the yield strength slightly, but markedly improved both the toughness and ductility. Author

N81-25193# National Materials Advisory Board, Washington, D. C.
RAPIDLY SOLIDIFIED (RS) ALUMINUM ALLOYS-STATUS AND PROSPECTS Final Report
1981 131 p refs
(Contract MDA903-78-C-0038)
(AD-A098702; NMAB-368) Avail: NTIS HC A07/MF A01 CSCL 11/6

A committee of the National Materials Advisory Board has conducted a study to evaluate the potential of particulate (rapidly solidified) aluminum alloys for a broad range of structural applications. The study included analysis of current experimental and near-term production alloys; selection of representative target properties and analysis of structural performance in representative aircraft systems; evaluation of alternative methods for producing sheet, plate, extrusion and forging mill products with emphasis on approaches for processing particulate directly to mill products; assessment of structural fabrication and assembly processes and potential associated problems; review of the metallurgical state of the art of these alloy systems; and extensive examination of potential applications in aircraft, military, and space

systems and commercial products. Significant conclusions and recommendations are presented that identify the future work *required to support adequately the continued development of* particulate aluminum alloys and to ensure the eventual availability of large-scale production quantities of these alloys. GRA

N81-25194# Battelle Columbus Labs., Ohio.
ENGINEERING DATA FOR NEW AEROSPACE MATERIALS Final Summary Report, Jun. 1978 - May 1980
Omar Deel Wright-Patterson AFB, Ohio AFWAL Jul. 1980 *152 p*
(Contract F33615-78-C-5040)
(AD-A098520; AFWAL-TR-80-4103) Avail: NTIS *HC A08/MF A01 CSCL 11/6*

The major objective was to evaluate recently developed materials or materials produced by different processes of interest *to the Air Force. Data sheet type presentations of engineering* data for these materials are provided. GRA

N81-25195# *Office of Naval Research, London (England).*
MEETING ON THE PHYSICS OF TRANSITION METALS
John R. Neighbours, Dimitris Papaconstantopoulos, and Barry *Klein 30 Oct. 1980* 9 p *Proceedings of the Intern. Conf.* held in Leeds, England, 18-22 Aug. 1980
(AD-A096734; C-10-80) Avail: NTIS HC A02/MF A01 CSCL 11/6

Band theory, ferromagnetism, ultrasonic attenuation, neutron scattering, magnetism, and Fermi surfaces were discussed. Other topics include positron annihilation, lattice dynamics, and heats of formation. E.D.K.

N81-25196# Battelle Pacific Northwest Labs., Richland, Wash.
CORROSION TESTING OF UNALLOYED TITANIUM IN SIMULATED DISPOSAL ENVIRONMENTS FOR REPROCESSED NUCLEAR WASTE Final Report
S. Henrikson and M. dePourbaix 7 Apr. 1981 43 p refs Transl. into ENGLISH from Studsvik Energiteknik AB(Sweden), E1-79/83, 7 May 1979
(Contract DE-AC06-76RL-01830)
(PNL-TR-410) Avail: NTIS HC A03/MF A01

On the commission of the nuclear safety project, corrosion tests were carried out on unalloyed titanium, which are to be used as an outer corrosion resistant canister for reprocessed nuclear waste. Tests were conducted for 300 days in a corrosive medium of modified Baltic water at 100 and 1300 C with high (8 ppM) or low (< 10 ppB) oxygen content. The tests at low oxygen content and 1000 C were continued for 600 days. Very low oxidation rates (0.01-0.1 (SIGMA)m/year) were obtained, corresponding to a lifetime of tens to hundreds of thousands of years for a 6-mm thick titanium canister. In spite of the considerably more severe corrosion conditions (higher temperature, higher chloride and fluoride contents, as well as lower pH) compared with those estimated for the final disposal, no signs of localized corrosion were found, nor could any hydrogen pickup be detected. DOE

N81-25197# Arizona Univ., Tucson. Dept. of Chemistry.
EXPERIMENTAL INVESTIGATION OF THE IONIZATIONS, ELECTRONIC STRUCTURE, AND BONDING OF SMALL MOLECULES ATTACHED TO TRANSITION METALS Progress Report, 1 Sep. 1980 - 1 Apr. 1981
Dennis L. Lichtenberger 1981 18 p
(Contract DE-AC02-80ER-10746)
(DOE/ER-10746/T1) Avail: NTIS HC A02/MF A01

Progress is reported on measurements of vibrational fine structure in the valence ionizations of group IVB hexacarbonyls. Emphasis is also placed on: the Jahn-Teller effect in the photoelectron spectrum of Fe(CO)5; the effects of methyl group substitution on metal coordinated cyclopentadienyl rings; valence ionizations of olefins coordinated to metals; and the valence electronic structure of bridging methylenes. DOE

N81-25198# Bendix Corp., Kansas City, Mo.
ALUMINUM ALLOY WELDING AND STRESS-CORROSION TESTING Final Report
W. G. Gates and E. Jimenez Apr. 1981 34 p refs
(Contract DE-AC04-76DP-00613)
(BDX-613-2543) Avail: NTIS HC A03/MF A01

The weldability, strength, and corrosion resistance of four 5XXX aluminum alloys electron beam welded to 6061-T6 *aluminum alloy without a filler metal were evaluated. Adding* filler metal raises weld energy requirements and makes the process more difficult to control. The four 5XXX alloys used (5456-H321, 5052-H34, 5086-H323, and 5083-H32) were selected for their high magnesium content which reduces weld crack sensitivity. DOE

N81-25199# Hanford Engineering Development Lab., Richland, *Wash.*
MECHANICAL PROPERTIES OF TYPE 316 STAINLESS STEEL MATERIALS AFTER IRRADIATION AT 515 DEG C *AND 585 DEG C*
L. D. Blackburn, D. L. Greenslade, and A. L. Ward Apr. 1981 86 p refs
(Contract DE-AC14-76FF-02170)
(HEDL-TME-81-4) Avail: NTIS HC A05/MF A01

Three different heats of type 316 SS base metal plate metals *and three different weld metals produced by shielded metal arc,* submerged arc, and gas tungsten arc processes with type 316 SS filler metal were used in the gas-cooled fast reactor (GCFR) *structural materials irradiation experiment. Pre-irradiation strength* and ductility properties over the range 240 C to 6500 C were very similar for the three base metal heats and were within the *expected range for this alloy. The three welds showed variations* in strength and ductility before irradiation, but properties were generally within the range to previous experience for austenitic stainless steel welds. Weld metals showed higher yield strength but lower uniforms and total elongations than those of base metal. DOE

N81-25200# Sandia Labs., Livermore, Calif. Materials Science Div.
CREEP AND THE CORROSION CHARACTERISTICS OF INCOLOY ALLOY 800 IN MOLTEN NITRATE SALTS
S. H. Goods Mar. 1981 25 p refs
(Contract DE-AC04-76DP-00789)
(SAND-81-8665) Avail: NTIS HC A02/MF A01

Incoloy Alloy 800 (I800) has been proposed for use in the receiver tube panel arrays in a number of advanced solar central receiver (SCR) concepts. Because of their high heat capacity and high thermal energy density, several designs require the use of molten sodium and potassium nitrate salt mixture to act as the cooling or heat transfer fluid. The effects of deformation on the corrosion resistance of Incoloy Alloy 800 in sodium nitrate and potassium nitrate salt mixtures have been studied. Hollow tube specimens filled with the salt mixture (60%-NaNO3-40% KNO3) were tested in constant load tension creep at elevated temperatures (5500 less than or equal to T less than or equal to 6700 C). Depending on the temperature and initial stress, fracture times (and therefore salt exposure times) ranged between 300 and 1000 hours. While the fracture strain of specimens tested to failure was only slightly reduced when exposed to the salt environment, metallographic observations of polished cross sections revealed severe surface oxidation. DOE

N81-25201# Bhabha Atomic Research Centre, Bombay (India). Chemistry Div.
OXIDATION OF ZIRCALOY-4 UNDER STATIC CONDITIONS
A. K. Dua and R. P. Agarwala 1980 8 p refs
(BARC-1043) Avail: NTIS (US Sales Only) HC A02/MF A01

Static autoclave oxidation of zircaloy-4 at 543 K and 8.5 MPa was studied. Deviations from the straight line in kinetics curve were observed. White spots appeared on the surface of the specimen even in the pre-transion region. It was concluded that these deviations may be partly arising due to the variations in the processing parameters and impurities in zircaloy-4. Scanning electron micrography was used to study the oxide coating after autoclave exposure of zircaloy-4 surface. DOE

N81-25202# Iowa State Univ. of Science and Technology, Ames. Dept. of Materials Science and Engineering.
CREEP OF MONOLITHIC REFRACTORY MATERIALS Final Report
Thomas D. McGee, Jay R. Smyth, and Donald J. Bray Nov. 1980 50 p

(Contract DE-AS05-78OR-13402; EPRI Proj. 1481)
(DOE/OR-13405/T1; ISU-ERI-AMES-81402) Avail: NTIS HC A03/MF A01

The objective was to evaluate the creep behavior of refractory materials used in the linings of coal gasification process vessels. The work is subdivided into nine tasks: literature review, equipment and materials selection, specimen preparation, short term creep measurements, analysis of test specimens, stress relaxation measurements, long term creep measurements, data correlation, and consultation. Materials tested were Al2O3 generic refractory and neat concretes, calcium-aluminate cements, and aggregates. DOE

N81-25203# Ames Lab., Iowa.
NORMAL SPECTRAL EMISSIVITIES OF LIQUID IRON, LIQUID NICKEL, AND LIQUID IRON-NICKEL ALLOYS M.S. Thesis
Pisant Ratanapupech 1980 79 p refs
(Contract W-7405-eng-82)
(IS-T-927) Avail: NTIS HC A05/MF A01

The normal spectral emissivities of liquid iron, liquid nickel, and liquid iron-nickel alloys over the complete range of composition were determined at wavelength lambda = 645 nm by an integral blackbody comparison method. The temperatures of the samples and the blackbody hole were determined by means of an automatic optical pyrometer. The method of calculation used Wien's equation. The normal spectral emissivities of liquid iron, liquid nickel, and liquid iron-nickel alloys were found to be constant with respect to changes in temperature from 1809 K to 1857 K for liquid iron, from 1729 K to 1823 K for liquid nickel, and from 1810 K to 1890 K for liquid iron-nickel alloys, respectively. The normal spectral emissivity of liquid iron-nickel alloy is dependent on composition. E.D.K.

N81-25204# Stanford Univ., Calif. Dept. of Materials Science and Engineering.
DIFFUSION OF OXYGEN IN LIQUID-METAL SYSTEMS Progress Report, 1 Jun. 1980 - 31 May 1981
David A. Stevenson Mar. 1980 83 p refs
(Contract DE-AT03-76ER-70037)
(SU-DMS-80-R-1) Avail: NTIS HC A05/MF A01

The ac electrical conductivity of yttria-stabilized zirconia solid electrolyte specimens, ZrO2 + 8 wt percent Y2O3, with porous Pt-paste electrodes was studied over a temperature range of 400 to 1000 C in air. The complex admittance of these specimens was determined over a frequency range from 2 Hz to 400 KHz. The true lattice (bulk) conductivity is separated from grain boundary effects and from electrode polarization through the analysis of the complex admittance plots. Several observations were made on the degradation and contamination of solid oxide electrolytes. DOE

N81-25205# Pennsylvania State Univ., University Park.
HYDROGEN ABSORPTION IN METALS: A FIELD ION MICROSCOPY STUDY Progress Report, 1 Jun. 1980 - 31 May 1981
T. Sakurai and H. W. Pickering Jan. 1981 11 p refs
(Contract DE-AC02-79ER-10430)
(DOE/ER-10430/T1) Avail: NTIS HC A02/MF A01

Progress in several areas is summarized: (1) compositional analysis of Ti clusters and H associated microcrack formation in Fe-Ti alloys; (2) grain boundary segregation of phosphorus in a Fe-0.04%P alloy; and (3) surface segregation of Cu in Ni-Cr alloys. In addition to these achievements, the construction of a new atom probe is under way, although some delay is anticipated before its completion. DOE

N81-25206# Pennsylvania Univ., Philadelphia. Dept. of Materials Science and Engineering.
ATOMISTIC STUDIES OF GRAIN BOUNDARIES WITH SEGREGATED IMPURITIES Progress Report, 1 Jul. 1980 - 30 Jun. 1981
V. Vitek Feb. 1981 17 p refs
(Contract DE-AS02-79ER-10429)
(DOE/ER-10429/T2) Avail: NTIS HC A02/MF A01

Atomistic studies of grain boundaries with impurities are described. The emphasis is on the effect of segregation upon the structure of grain boundaries and their properties. Since the necessary precursor of any atomistic study is a description of interatomic interactions an empirical scheme for the construction of interatomic potentials was first developed. In this scheme the interatomic interactions are described by pair potentials together with a volume dependent term which represents a major contribution to the overall energy of the studied system. A relaxation method developed that includes the volume dependent term into the calculations which are then carried out at constant pressure rather than at constant volume and the possibility of dealing with spatially varying concentration of impurities is described. DOE

N81-25207# Illinois Inst. of Tech., Chicago.
SELECTIVE METAL-ION EXTRACTION FOR MULTIPLE ION LIQUID-LIQUID EXCHANGE REACTIONS Progress Report, 1 Mar. 1980 - 28 Feb. 1981
L. L. Tavlarides Mar. 1981 44 p refs
(Contract DE-AS02-79ER-10406)
(DOE/ER-10406/T2) Avail: NTIS HC A03/MF A01

The chemical kinetics and thermodynamic chemical equilibria models for the system copper-iron-acid sulfate solutions extracted by beta-alkenyl-8-hydroxy quinoline in xylene are determined. These models can be employed with appropriate design equations to predict selectivity factors of the desired species for mixer settler or other two phase contactors. A thermodynamic equilibrium model was developed to describe the distribution of copper only between the aqueous and organic phases. The model considers the aqueous phase ionic equilibria and accounts for impurities in the extractant. The equation for the temperature dependent thermodynamic equilibrium coefficient is also determined. Kinetic data for the copper-sulfate-beta-alkenyl-8-hydroxy quinoline were obtained using the liquid jet recycle reactor and a kinetic model was developed. It was determined that the flux of copper is not diffusion controlled but either reaction controlled or mass transfer and reaction controlled. DOE

N81-25208# California State Dept. of Transportation, Sacramento. Structural Materials Branch
FRACTURE TOUGHNESS OF STRUCTURAL GRADE BRIDGE STEELS, PART 2 Final Report
C. B. Kendrick, R. D. Smith, and W. F. Crozier Apr. 1980 171 p refs Sponsored in part by DOT
(PB81-156770; TL-636708) Avail: NTIS HC A08/MF A01 CSCL 11F

Tests were performed to determine how brittle fracture resistances of bridge steels vary with loading rate. Critical stress intensities of four ASTM A36 and A441 steels were measured at 32 F at impact loading rates with instrumented Charpy impact tests and at bridge and slow loading rates with 2-inch compact tension tests performed with a cyclic minor load superimposed on the test load. Methods were developed to estimate the minimum critical stress intensity for ductile fracture, and the impact test values and temperatures required to assure this property. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N81-25209* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
METHOD FOR APPLYING PHOTOGRAPHIC RESISTS TO OTHERWISE INCOMPATIBLE SUBSTRATES Patent
Wolfgang Fuhr, inventor (to NASA) (United States Radium Corp. Parsippany, N.J.) Issued 14 Apr. 1981 4 p Filed 31 Oct. 1978 Supersedes N79-19319 (17 - 10, p 1279) Sponsored by NASA
(NASA-Case-MSC-18107-1; US-Patent-4,262,080; US-Patent-Appl-SN-956168; US-Patent-Class-430-271; US-Patent-Class-430-325; US-Patent-Class-430-329; US-Patent-Class-430-330) Avail: US Patent and Trademark Office CSCL 11A

A method for applying photographic resists to otherwise incompatible substrates, such as a baking enamel paint surface,

is described wherein the uncured enamel paint surface is coated with a non-curing lacquer which is, in turn, coated with a partially cured lacquer. The non-curing lacquer adheres to the enamel and a photo resist material satisfactorily adheres to the partially cured lacquer. Once normal photo etching techniques are employed the lacquer coats can be easily removed from the enamel leaving the photo etched image. In the case of edge lighted instrument panels, a coat of uncured enamel is placed over the cured enamel followed by the lacquer coats and the photo resists which is exposed and developed. Once the etched uncured enamel is cured, the lacquer coats are removed leaving an etched panel.
Official Gazette of the U.S. Patent and Trademark Office

N81-25210 Lehigh Univ., Bethlehem, Pa.
PREPARATION, CHARACTERIZATION AND ALKALI-SWELLING BEHAVIOR OF CARBOXYLATED LATEXES Ph.D. Thesis
Shozo Nishida 1981 147 p
Avail: Univ. Microfilms Order No. 8108194

Methyl methacrylate (MMA) methacrylic acid (MAA) copolymer latexes with MAA content from 5 to 25 weight percent were prepared as a model system of alkali swellable carboxylated latexes by means of two polymerization processes, i.e., batch process and semi continuous process. The polymerization process was found to greatly influence the distribution of carboxyl groups in the final latex particles, which in turn influenced the alkali swelling and/or dissolving behavior of the carboxylated latexes. The MMA-MAA copolymer latexes prepared by the batch process contained less uniform distribution of carboxyl groups inside the particle and exhibited a moderate increase in viscosity followed by a slow decrease with increasing pH. The MMA/MAA copolymer latexes with similar composition prepared by the semi continuous process, in which the rate of monomer feed was taken to be much less than the maximum rate of polymerization, contained more uniform distribution of carboxyl groups inside the particle, and exhibited great increase in viscosity followed by rapid decrease with increasing pH. Dissert. Abstr.

N81-25211*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Metallurgy and Materials Science.
MICROSTRUCTURE AND MECHANICAL PROPERTIES OF BULK YTTRIA-PARTIALLY-STABILIZED ZIRCONIA Final Report
Peter G. Valentine, Ralph D. Maier, and Terence E. Mitchell 30 Jun. 1981 80 p
(Grant NsG-3252)
(NASA-CR-164438) Avail: NTIS HC A05/MF A01 CSCL 11B

A commercially available bulk 4.5 mole percent yttria-(Y_2O_3) partially stabilized zirconia (PSZ) was studied by light microscopy, X-ray analysis, microhardness measurement, and fracture toughness testing. The growth of the precipitates and the phase transformations were studied as a function of aging in air at 1500 C. Aging curves were constructed for both the as received and the solution annealed and quenched materials; the curves showed hardness peaks at 1397 and 1517 Kg/sq mm respectively. The rectangular plate shaped tetragonal precipitates were found to have a 110 habit plane. A total of twelve different types of tetragonal precipitates were found. Grinding of the Y_2O_3 PSZ into powder did not cause a significant amount of metastable tetragonal precipitates to transform into the monoclinc phase, thus indicating that transformation toughening is not a significant mechanism for the material. Author

N81-25212*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A NOVEL ADDITION POLYIMIDE ADHESIVE
Terry L. St.Clair and Donald J. Progar Mar. 1981 12 p refs
(NASA-TM-81976) Avail: NTIS HC A02/MF A01 CSCL 11A

An addition polyimide adhesive, LARC 13, was developed which shows promise for bonding both titanium and composites for applications which require service temperatures in excess of 533 K. The LARC 13 is based on an oligomeric bis nadimide containing a meta linked aromatic diamine. The adhesive melts prior to polymerization due to its oligomeric nature, thereby allowing it to be processed at 344 kPa or less. Therefore, LARC 13 is ideal for the bonding of honeycomb sandwich structures. After melting, the resin thermosets during the cure of the nadic endcaps to a highly crosslinked system. Few volatiles are evolved, thus allowing large enclosed structures to be bonded. Preparation of the adhesive as well as bonding, aging, and testing of lap shear and honeycomb samples are discussed. E.D.K.

N81-25213*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FLOW PROPERTIES OF A SERIES OF EXPERIMENTAL THERMOPLASTIC POLYMIDES
Harold D. Burks, James B. Nelson, and Howard L. Price Apr. 1981 29 p refs Presented at the Soc. of Rheology 52nd Ann. Meeting, Williamsburg, Va., 23-25 Feb. 1981
(NASA-TM-83115) Avail: NTIS HC A03/MF A01 CSCL 07C

The softening temperature to degradation temperature range of the polymers was about 440 to 650 K. All of the polymers retained small amounts of solvent as indicated by an increase in T(sub g) as the polymers were dried. The flow properties showed that all three polymers had very high apparent viscosities and would require high pressures and/or high temperatures and/or long times to obtain adequate flow in prepregging and molding. Although none was intended for such application, two of the polymers were combined with carbon fibers by solution prepregging. The prepregs were molded into laminates at temperatures and times, the selection of which was guided by the results from the flow measurements. These laminates had room temperature short beam shear strength similar to that of carbon fiber laminates with a thermosetting polyimide matrix. However, the strength had considerable scatter, and given the difficult processing, these polymides probably would not be suitable for continuous fiber composites. E.D.K.

N81-25214# Saint Josephs Univ., Philadelphia, Pa. Dept. of Chemistry.
THE SYNTHESIS AND EVALUATION OF 15-KETO-PGBI ANALOGUES Annual Technical Report, 1 Jan. 1980 - 1 Mar. 1981
George L. Nelson 1 Mar. 1981 32 p refs
(Contract N00014-80-C-0117)
(AD-A098304; ATR-1) Avail: NTIS HC A03/MF A01 CSCL 06/15

The ethyl analogue, 3-(trans-3-keto-1-pentenyl)-2-cyclopentenone, was prepared as a structurally more suitable model for the investigation of the base promoted conversion of 15-keto-PGB1 to an oligometric mixture termed PGBX. Base treatment of the ethyl analogue results in the conversion to an oligomeric mixture capable of protecting against the loss of oxidative phosphorylation in isolated nitrochondria without inhibition at higher concentrations as observed for PGBX. The chemistry of the oligomerization was investigated and has major implications for an understanding of the complexity of the oligomeric mixture PGBX. DOE

N81-25215# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Nonmetallic Materials Div.
INTERFACIAL SHEAR STRENGTH AND FAILURE MECHANISMS IN GRAPHITE FIBER COMPOSITES Interim Report, Jan. 1979 - Jan. 1980
L. T. Drzal, M. J. Rich (Dayton Univ.), J. D. Camping (Dayton Univ.), and W. J. Park (Wright State Univ.) Jan. 1981 15 p refs Presented at the 35th Reinforced Plastics/Composites Proceedings, 1980; sponsored by the Society of the Plastics Industry Submitted for publication
(AF Proj. 2419)
(AD-A097050; AFWAL-TR-81-4003) Avail: NTIS HC A02/MF A01 CSCL 11/9

A method of determining interfacial shear strength in composite systems was developed. The method combines the single filament shear lag fracture approach in interfacial shear strength determinations with direct microscopic observation of the strained sample under polarized transmitted light. This technique provides insight into the effect of chemical surface treatments, fiber defects, and processing induced flaws on the degree and type of fiber matrix interaction in graphite fiber epoxy composites. Surface treatments of graphite fibers alter the surface chemistry by increasing the polarity of the fiber surface as observed by changes in the stress fields in single filament

specimens as well as a change in interfacial shear strength. Processing induced defects are also observed. R.C.T.

N81-25216# Dayton Univ., Ohio.
ADHESIVE BONDING FOR SHELTERS Final Summary Report, Dec. 1977 - Aug. 1980
D. R. Askins and James C. McKiernan Dec. 1980 113 p
(Contracts F33615-80-C-5011; F33615-78-C-5002; AF Proj. 2421)
(AD-A097049; AFWAL-TR-80-4183; UDR-TR-80-88) Avail: NTIS HC A06/MF A01 CSCL 11/1

A testing scheme for evaluating candidate shelter adhesives was developed by the shelter industry. Adhesives were identified which have the capability of retaining a substantial portion of their structural integrity after prolonged exposure to the combined effects of elevated temperature and high humidity. The effects of several adherent surface preparation variables upon the interfacial durability of bonded joints were also evaluated. Seven adhesives were evaluated for their lap shear, peel, and stress-durability characteristics. R.C.T.

N81-25217# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
WATER-DEUTERIUM OXIDE EXCHANGE IN POLYMERS USED IN SPACECRAFT APPLICATIONS Interim Report
David J. Carre 15 Apr. 1981 24 p refs
(Contract F04701-80-C-0081)
(AD-A098714; TR-0081(6970-03)-1; SD-TR-81-26) Avail: NTIS HC A02/MF A01 CSCL 20/14

The replacement of water (H2O) by deuterium oxide (D2O) and the exchange between atmospheric water and adsorbed or absorbed D2O were investigated for the polymeric materials Kapton and Mylar using thermal gravimetric analysis (TGA) and infrared (IR) spectroscopy. Replacement of H2O by D2O is easily accomplished. However, exposure of D2O samples to the ambient atmosphere or gases containing H2O results in rapid proton and deuteron exchange between H2O vapor and adsorbed D2O. Replacement of H2O by D2O would not be a practical solution to alleviate spectral interferences that would result from water outgassing in spacecraft orbital environments. Maintaining the materials of interest in a dehydrated state is a more reasonable approach. Author (GRA)

N81-25218# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
APPLICATION OF REGULARIZATION QUADRATIC PROGRAMMING TO MECHANICAL RELAXATION SPECTRUM CALCULATION Final Report, May 1979 - May 1980
C. Y-C. Lee, D. R. Wiff (Dayton Univ.), and V. G. Rodgers (Dayton Univ.) Aug. 1980 27 p refs
(AD-A098622; AFWAL-TR-80-4160) Avail: NTIS HC A03/MF A01 CSCL 11/9

The regularization quadratic programming approach to infer relaxation spectra from experimental mechanical data was studied. It was found that the inferior of the sum of the squared difference between the input data and the back calculated values did not yield a satisfactory relaxation spectrum as the regularization weighting parameter alpha was increased. A modification was made to the function to be minimized so that all data points were equally weighted. Quadratic programming was then found to be sufficient to infer a reliable relaxation spectrum if the input experimental data had a high degree of accuracy. When the experimental data were not sufficiently accurate, regularization over-regularized the high value region of the solution spectrum before it could improve the low value region. Decreasing the number of sought after points in the solution spectrum can compensate for the noise level in the input experiment data, and will allow inferring a reliable relaxation spectrum from the experimental data. Author (GRA)

N81-25219# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Materials Lab.
TORSION IMPREGNATED CLOTH ANALYSIS (TICA) Final Report, Apr. 1979 - Apr. 1980
C. Y-C. Lee, I. J. Goldfarb, and J. D. Henes (Dayton Univ.) Jul. 1980 35 p refs
(AF Proj. 2303; AF Proj. 2419)
(AD-A098499; AFWAL-TR-80-4159) Avail: NTIS HC A03/MF A01 CSCL 14/2

Torsion Impregnated Cloth Analysis (TICA) uses fiber glass cloth as support for polymeric resins and measures the cloth-resin composite's in-phase and out-of-phase dynamic mechanical responses with a Rheometrics Mechanical Spectrometer. The TICA thermoscan results of a thermo-plastic were compared with that of the neat material. A similar comparison was made between the isothermal curing results of a thermosetting resin and the corresponding parallel plate and TBA measurements. The peaks associated with the vitrification were verified to correspond to those in the glass transition region. Author (GRA)

N81-25220# Army Electronics Technology and Devices Lab., Fort Monmouth, N. J.
CHEMICAL FACTORS IN THE DEGRADATION AND SELECTIVE DISSOLUTION OF METHACRYLATEBASED ELECTRON BEAM RESIST POLYMERS: A NUCLEAR MAGNETIC RESONANCE AND ELECTRON SPIN RESONANCE STUDY
Burkhard E. Wagner Mar. 1981 35 p
(DA Proj. 1L1-61102-AH-47)
(AD-A098457; DELET-TR-81-10) Avail: NTIS HC A03/MF A01 CSCL 11/9

The dissolution of selected electron-beam resist polymers was studied by wide-line-NMR/Dynamic Nuclear Polarization signal enhancement techniques under experimentally restrictive conditions. It was demonstrated that d(6) -acetone is suitable for NMR-based dissolution studies, and that the amount of polymer required for a dissolution experiment can be reduced by a factor of ten (to 0.2 g) by selection of novel radical spin polarization materials. Studies of scarce experimental or irradiated polymers are now more feasible. The beneficial effects of carboxylate and halocarbon substituents on the dissolution properties of methacrylate resists were demonstrated. An attempt was made to investigate the effect of various parameters on dissolution properties in acetone slurry (irradiation, molecular weight, molecular weight distribution, polymer surface characteristics or morphology), but in the unstirred environment of the experimental set-up, dissolution properties consistently ran counter to those expected from dissolution theory for well-mixed systems. The existence of a gel barrier to dissolution was not only inferred from the dissolution experiments, but also could be confirmed visually in selected samples. The gel barrier phenomenon may affect dissolution behavior inside the freshly-cut channels of the resist, where convection would be least effective. In other dissolution experiments, it was demonstrated that the sensitivity of the instrumentation is not sufficient to make 19-F NMR an acceptable alternative to 1-HNMR in dissolution studies of fluoropolymers. Author (GRA)

N81-25221# Virginia Polytechnic Inst. and State Univ., Blacksburg. Coll. of Engineering.
THE WEAR OF POLYMERS BY TRANSFER TO HARD, ROUGH SURFACES Final Report, 1 Mar. 1977 - 31 Dec. 1980
Norman S. Eiss, Jr. 27 Feb. 1981 110 p refs
(DAAG29-77-G-0102)
(AD-A098478; ARO-14658.7-E) Avail: NTIS HC A06/MF A01 CSCL 11/9

A surface topography characterization system consisting of a talysurf 4 profilometer, Zonic analog-to-digital converter and Fast Fourier Transform (FFT), and a Tetronix 4051 minicomputer was interfaced to an IBM 370 digital computer. Software for the computation of several surface parameters and for wear models have been written. Single traversal wear experiments were performed on a pin-on-disk machine at sliding velocities less than 1 cm/s. Experiments run at a constant bearing area ratio showed no difference in the wear rates of PVC and PCTFE while the wear rates of LDPE were less than both on ground surfaces. The presence of a vapor deposited film of poly (chloro-p-xylylene) did not affect the wear of PVC and PCTFE but reduced the wear of LDPE. A wear model was developed which correctly predicted the decrease in wear rate which occurs as the surface voids fill up with polymer debris, and the maximum wear occurs as the bearing area ratio is increased. Multiple traversal wear experiments were run at sliding velocities up to 1.4 m/s using LDPE and PVC pins on steel disks. PVC with a molecular weight of 40,000 had higher wear rates than

70,000 MW PVC except when calculated temperatures exceeded the glass transition temperature. A pin on disk wear machine was fabricated with a speed range from 3 to 4,400 rpm, a test chamber with temperature controlled up to 300 C, and a low inertia pneumatic loading piston. GRA

N81-25222# Rockwell International Science Center, Thousand Oaks, Calif. Structural Ceramics Group.
RESEARCH OF MICROSTRUCTURALLY DEVELOPED TOUGHENING MECHANISMS IN CERAMICS. PART 2: CONTRIBUTION TO FRACTURE TOUGHNESS Technical Report, 1 Dec. 1980 - 1 Apr. 1981
F. F. Lange Mar. 1981 15 p refs
(Contract N00014-77-C-0441)
(AD-A098422; SC5117.9TR; TR-9) Avail: NTIS HC A02/MF A01 CSCL 11/2

Two different approaches are used to determine the contribution of a stress-induced phase transformation to the fracture toughness of a brittle material. Special reference is made to the ZrO2 (tetragonal) yields ZrO2 (monoclinic) transformation. GRA

N81-25223# Rockwell International Science Center, Thousand Oaks, Calif. Structural Ceramics Group.
RESEARCH OF MICROSTRUCTURALLY DEVELOPED TOUGHENING MECHANISMS IN CERAMICS. PART 3: EXPERIMENTAL OBSERVATIONS IN THE ZrO2-Y2O3 SYSTEM Technical Report, 1 Dec. 1980 - 1 Apr. 1981
F. F. Lange Mar. 1981 20 p refs
(Contract N00014-77-C-0441)
(AD-A098423; SC5117.10TR; TR-10) Avail: NTIS HC A02/MF A01 CSCL 11/2

Materials in the ZrO2-Y2O3 system were fabricated to investigate the conditions required to retain the metastable, tetragonal phase and to determine the contribution of the stress-induced martensitic reaction to fracture toughness. Retention of the tetragonal phase was optimized by minimizing porosity and maintaining the grain size below a critical valve. The critical grain size increased from 0.2 micrometers to 1 micrometer for compositions ranging between 2 m/o Y2O3 to 3 m/o Y2O3, respectively. These results are consistent with the theories developed regarding the thermodynamics of the martensitic reaction in a constrained state. In the tetragonal plus cubic phase field (compositions between 3.0 and 7.5 m/o Y2O3), the critical stress intensity factor decreased from 6.3 MPa.m1/2 to 3.0 MP.a1/2 as the volume fraction of the retained, tetragonal phase decreased to zero. Theoretical results, derived from the concept that the crack's stress field does work to unconstrain the transformation, are in good agreement with the experimental results. Author (GRA)

N81-25224# Rockwell International Science Center, Thousand Oaks, Calif. Structural Ceramics Group.
RESEARCH OF MICROSTRUCTURALLY DEVELOPED TOUGHENING MECHANISMS IN CERAMICS. PART 4: FABRICATION, FRACTURE TOUGHNESS AND STRENGTH OF Al2O3/ZrO2 Technical Report, 1 Dec. 1980 - 1 Apr. 1981
F. F. Lange Mar. 1981 22 p refs
(Contract N00014-77-C-0441)
(AD-A098424; SC5117.11TR; TR-11) Avail: NTIS HC A02/MF A01 CSCL 11/2

Three Al2O3/ZrO2 composite series, containing 0, 2 and 7.5 mole % Y2O3, were fabricated for fracture toughness determinations. Without Y2O3 additions, 2 m/o Y2O3 allowed full retention up to 60 v/o ZrO2. Cubic ZrO2 was produced with additions of 7.5 m/o Y2O3. Significant toughening and strengthening was achieved when tetragonal ZrO2 was present. Author (GRA)

N81-25225# Rockwell International Science Center, Thousand Oaks, Calif. Structural Ceramics Group.
RESEARCH OF MICROSTRUCTURALLY DEVELOPED TOUGHENING MECHANISMS IN CERAMICS. PART 5: EFFECT OF TEMPERATURE AND ALLOY ON FRACTURE TOUGHNESS Technical Report, 1 Dec. 1980 - 1 Apr. 1981
F. F. Lange Mar. 1981 21 p
(Contract N00014-77-C-0441)
(AD-A098425; SC5117.12TR; TR-12) Avail: NTIS HC A02/MF A01 CSCL 11/2

The critical stress intensity factor (Kc) of materials containing tetragonal ZrO2 was found to decrease with increasing temperature and CeO2 alloying additions, as predicted by theory. The temperature dependence of Kc was related to the temperature dependence of the chemical free energy change associated with the tetragonal yields monoclinic transformation. Good agreement with thermodynamic data available for pure ZrO2 was obtained when the size of the transformation zone associated with the crack was equated to the size of the ZrO2 grains. The Kc vs CeO2 addition data was used to estimate the tetragonal, monoclinic, cubic eutectoid temperature of 270 C in the ZrO2-CeO2 binary system. Author (GRA)

N81-25226# Bendix Corp., Kansas City, Mo.
LOW-TEMPERATURE CURING OF A NITRILE-EPOXY ADHESIVE Final Report
J. S. Tira Apr. 1981 20 p ref
(Contract DE-AC04-76DP-00613)
(BDX-613-2553) Avail: NTIS HC A02/MF A01

Adhesive strength and glass transition temperature were correlated with cure times at 850 C and above. The effect of moisture on adhesive cure and strength was tested. With a three hour cure at 850 C, lap shear strength met specification requirements. The adhesive was found to absorb moisture with time, especially if one or both polyethylene covers are removed. Placing the adhesive in a desiccator for 30 minutes produced excellent room temperature shear strengths. Preconditioning (removal of moisture) is critical for elevated temperature cures. DOE

N81-25227# National Bureau of Standards, Washington, D.C.
GLASSY THIN FILMS Final Report
W. Haller, D. M. Sanders, and E. N. Farabaugh 27 Jan. 1981 13 p refs
(Contract DE-AI08-79DP-40095)
(DOE/DP-40095/T1) Avail: NTIS HC A02/MF A01

The initial results of a long term program to study order-disorder phenomena in dielectric thin films is described. An apparatus was constructed to permit the codeposition of a glass forming additive such as SiO2 in a polycrystalline matrix film such as MgO. The extent of crystallinity of mixture films in the MgO-SiO2 system was determined using techniques developed for X-ray powder diffraction. With this approach, it was determined that the addition of SiO2 in concentrations less than 20 mass % has a relatively small influence on crystallinity. On the other hand, at concentrations greater than 25% SiO2 causes the mixture film to become completely disordered. DOE

N81-25228# Department of Energy, Morgantown, W. Va. Energy Technology Center.
CERAMIC CORROSION/EROSION PROJECT DESCRIPTION
C. V. Nakaishi and L. K. Carpenter Feb. 1981 141 p refs
(DOE/METC-SP/111) Avail: NTIS HC A07/MF A01

The development of ceramic materials which could be used by stationary gas power turbines operating with a high temperature, coal derived, low Btu gas products-of-combustion environment is examined. Two facilities were designed and installed to burn a varying low Btu coal derived gas in a controlled manner. The objectives and testing philosophy as well as the operating, specimen handling, and emergency procedures for the facilities are discussed. DOE

N81-25229# Pennsylvania State Univ., University Park. Materials Research Lab.
STRUCTURE OF GLASSES CONTAINING TRANSITION METAL IONS Progress Report, 1 Feb. 1980 - 31 Jan. 1981
William B. White, Karen Fox, Janet S. Herman, Cheryl Houser, and Carolynn Nelson Jan. 1981 150 p refs
(COO-2754-6; DOE/ER-02754/T1) Avail: NTIS HC A07/MF A01

The optical absorption spectra of nickel and iron in a variety of glasses were examined. Utilization of luminescence in addition to optical absorption spectra permitted the identification of several iron arrangements in glass. The investigation of diffusion processes,

particularly hydrogen diffusion, by sputter-induced photon spectrometry (SIPS) has removed from qualitative demonstration to quantitative calculation. DOE

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N81-25230*# Spectra Research Systems, Inc., Huntsville, Ala.
ADVANCED TECHNOLOGY APPLICATIONS FOR SECOND AND THIRD GENERAL COAL GASIFICATION SYSTEMS Final Report
Rodney Bradford, John D. Hyde, and C. Wendell Mead 10 Jul. 1980 189 p refs
(Contract NAS8-33846)
(NASA-CR-161771; SRS/SE-TR80-11) Avail: NTIS HC A09/MF A01 CSCL 21D

The historical background of coal conversion is reviewed and the programmatic status (operational, construction, design, proposed) of coal gasification processes is tabulated for both commercial and demonstration projects as well as for large and small pilot plants. Both second and third generation processes typically operate at higher temperatures and pressures than first generation methods. Much of the equipment that has been tested has failed. The most difficult problems are in process control. The mechanics of three-phase flow are not fully understood. Companies participating in coal conversion projects are ordering duplicates of failure prone units. No real solutions to any of the significant problems in technology development have been developed in recent years. A.R.H.

N81-25231*# Spectra Research Systems, Inc., Huntsville, Ala.
ADVANCED TECHNOLOGY APPLICATIONS FOR SECOND AND THIRD GENERATION COAL GASIFICATION SYSTEMS. APPENDIX
Rodney Bradford, John D. Hyde, and C. Wendell Mead 10 Jul. 1980 116 p refs
(Contract NAS8-33846)
(NASA-CR-161772; SRS/SE-TR80-11-App) Avail: NTIS HC A06/MF A01 CSCL 21D

Sixteen coal conversion processes are described and their projected goals listed. Tables show the reactants used, products derived, typical operating data, and properties of the feed coal. A history of the development of each process is included along with a drawing of the chemical reactor used. A.R.H.

N81-25232*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AVIATION TURBINE FUEL PROPERTIES AND THEIR TRENDS
Robert Friedman 1981 27 p refs Proposed for presentation at the West Coast Intern. Meeting, Seattle, 3-6 Aug. 1981; sponsored by the Society of Automative Engineers
(NASA-TM-82603; E-851) Avail: NTIS HC A03/MF A01 CSCL 21D

Fuel property values and their trends were studied through a review of a recognized, wide ranging sample population from actual fuel inspection data. A total of 676 fuel samples of Jet A aviation turbine fuel were compiled over an eleven year period. Results indicate that most fuel samples have one to three near-specification properties, the most common being aromatics, smoke point, and freezing point. R.C.T.

N81-25233*# Spectra Research Systems, Inc., Huntsville, Ala.
COAL CONVERSION SYSTEMS DESIGN AND PROCESS MODELING. VOLUME 1: APPLICATION OF MPPR AND ASPEN COMPUTER MODELS Final Report
1 Jun. 1981 200 p refs 2 Vol.
(Contract NAS8-34264)
(NASA-CR-161779; SRS/SE-TR81-101-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 21D

The development of a coal gasification system design and mass and energy balance simulation program for the TVA and other similar facilities is described. The materials-process-product model (MPPM) and the advanced system for process engineering (ASPEN) computer program were selected from available steady state and dynamic models. The MPPM was selected to serve as the basis for development of system level design model structure because it provided the capability for process block material and energy balance and high-level systems sizing and costing. The ASPEN simulation serves as the basis for assessing detailed component models for the system design modeling program. The ASPEN components were analyzed to identify particular process blocks and data packages (physical properties) which could be extracted and used in the system design modeling program. While ASPEN physical properties calculation routines are capable of generating physical properties required for process simulation, not all required physical property data are available, and must be user-entered. A.R.H.

N81-25234*# Spectra Research Systems, Inc., Huntsville, Ala.
COAL CONVERSION SYSTEMS DESIGN AND PROCESS MODELING. VOLUME 2: INSTALLATION OF MPPM ON THE SIGNAL 9 COMPUTER Final Report
1 Jun. 1981 43 p refs 2 Vol.
(Contract NAS8-34264)
(NASA-CR-161780; SRS/SE-TR81-101-Vol-2) Avail: NTIS HC A03/MF A01 CSCL 21D

Relevant differences between the MPPM resident IBM 370 computer and the NASA Sigma 9 computer are described as well as the MPPM system itself and its development. Problems encountered and solutions used to overcome these difficulties during installation of the MPPM system at MSFC are discussed. Remaining work on the installation effort is summarized. The relevant hardware features incorporated in the program are described and their implications on the transportability of the MPPM source code are examined. A.R.H.

N81-25235# Committee on Science and Technology (U. S. House).
OVERSIGHT: ALCOHOL FUELS
Washington, D.C. GPO 1980 118 p Hearing before the Subcomm. on Energy Develop. and Appl. of the Comm. on Sci. and Technol., 96th Congr., 2nd Sess., no. 125, 22 Feb. 1980 (GPO-63-226) Avail: Subcommittee on Energy Development and Applications

Industrial, agricultural, and technical witnesses discuss research, development, and demonstration needs that should be considered in reviewing the DOE budget request for the alcohol fuels and biomass programs. Physical plant planning, distillery construction, transportation systems, and materials for feedstocks for fermentation to ensure a continuous supply of alcohol products not dependent on the weather or good and bad crop years are among the factors discussed. The proper role of the agricultural sector in successfully achieving the goals of the announced alcohol program is considered. J.M.S.

N81-25236# Committee on Energy and Natural Resources (U.S. Senate).
PRODUCTION OF OIL FROM TAR SAND AND OTHER HYDROCARBON DEPOSITS
Washington GPO 1980 145 p Hearing on S. 2717 and H. R. 7242 before the Subcomm. on Energy Resources and Mater. Production of the Comm. on Energy and Nat. Resources, 96th Congr., 2nd Sess., 4 Sep. 1980
(Publ-96-148; GPO-68-638) Avail: Subcommittee on Energy Resources and Materials Productions

Two bills that propose to tap America's tar sand energy resources are considered. Particular attention is given to the level of the technology base necessary to recover significant quantities of oil. It is reported that the United States possesses an estimated 30 billion barrels of tar sand oil of which approximately 2 billion barrels are recoverable with existing technology. The need to developed commercial production in this area is discussed. R.C.T.

N81-25237*# Technology Development Corp., Huntsville, Ala.
COAL CONVERSION PRODUCTS INDUSTRIAL APPLICATIONS Final Report
Dennis Warren and Joseph Dunkin Jul. 1980 267 p

(Contract NAS8-33843)
(NASA-CR-161773; TDC-80-019) Avail: NTIS HC A12/MF A01 CSCL 21D

The synfuels economic evaluation model was utilized to analyze cost and product economics of the TVA coal conversion facilities. It is concluded that: (1) moderate yearly future escalations (> 6%) in current natural gas prices will result in medium-Btu gas becoming competitive with natural gas at the plant boundary; (2) utilizing DRI price projections, the alternate synfuel products, except for electrity, will be competitive with their counterparts; (3) central site fuel cell generation of electricity, utilizing MBG, is economically less attractive than the other synthetic fuels, given projected price rises in electricity produced by other means; and (4) because of estimated northern Alabama synfuels market demands, existing conventional fuels, infrastructure and industrial synfuels refrofit problems, a diversity of transportable synfuels products should be produced by the conversion facility. A.R.H.

N81-25238*# Spectra Research Systems, Inc., Huntsville, Ala.
COAL LIQUEFACTION PROCESSES AND DEVELOPMENT REQUIREMENTS ANALYSIS FOR SYNTHETIC FUELS PRODUCTION Final Report
15 Oct. 1980 157 p refs
(Contract NAS8-34046)
(NASA-CR-161770; SRS/SE-TR80-12) Avail: NTIS HC A08/MF A01 CSCL 21D

Focus of the study is on: (1) developing a technical and programmatic data base on direct and indirect liquefaction processes which have potential for commercialization during the 1980's and beyond, and (2) performing analyses to assess technology readiness and development trends, development requirements, commercial plant costs, and projected synthetic fuel costs. Numerous data sources and references were used as the basis for the analysis results and information presented. E.D.K.

N81-25239# Ashland Chemical Co., Dublin, Ohio. Specialty Fuels Dept.
CATALYST COMPLEXED CARBON SLURRY FUEL DEVELOPMENT Final Report, 21 Apr. - 15 Nov. 1980
Richard A. Johnson and Richard L. Linard Jan. 1981 52 p refs
(Contract F33615-80-C-2043; AF Proj. 3048)
(AD-A098017; AFWAL-TR-80-2127) Avail: NTIS HC A04/MF A01 CSCL 21/4

Catalyzed carbon blacks and a control sample were prepared for the purpose of evaluating the effectiveness of the catalyst in the improvement of carbon slurry combustion. Two batches (100 pounds each) of carbon black containing 0.2 and 0.99 percent iron catalyst highly dispersed within the carbon structure were produced. Each carbon black was thoroughly characterized by the standard methods used in the carbon black industry. Slurries (five gallons each) were prepared using state-of-the-art dispersing technology at a carbon black loading of 25 weight percent, with JP-10 as the liquid carrier. With the objective of evaluating the effect of carbon black particle size on the combustion efficiency of carbon slurries, four commercial carbon blacks representing a wide particle size range were selected and slurries were prepared. The carbon blacks selected and their average calculated particle diameter (in nanometers) were: United N219 (30 nm), United N660 (56 nm), United SL-90 (103 nm), and Statex MT (300 nm). Slurries (five gallons each) were prepared with each carbon black at a loading of 25 weight percent with JP-10 as the liquid carrier. In addition, slurries containing 65 weight percent Statex MT and 60 weight percent United SL-90 were also prepared in five gallon quantities. Each carbon slurry fuel was characterized by measurement of the viscosity, density, net heat of combustion, flash point, and stability to centrifugation (900 g for 30 minutes). The viscosity of each slurry was measured at 0 C, 25 C and 40 C over a wide range of shear rates. GRA

N81-25240# Naval Postgraduate School, Monterey, Calif.
AN INVESTIGATION OF THE COMBUSTION BEHAVIOR OF SOLID FUEL RAMJETS M.S. Thesis
Michael Emmanuel Metochianakis Dec. 1980 90 p refs
(AD-A098481) Avail: NTIS HC A05/MF A01 CSCL 21/4

An experimental investigation was conducted to determine if there was a relationship between basic fuel properties and obtainable solid fuel ramjet combustion efficiency. The thermal behavior of different fuels was examined using differential thermal analysis and gas chromatography. Hot firings were made for those fuels with significantly different thermal characteristics. Fuels that had a dominant endothermic decomposition behavior and that produced low molecular weight pyrolysis gases had high combustion efficiency in non-bypass configurations. Fuels with low temperature exothermic behavior and high molecular weight pyrolysis gases had high combustion efficiency when bypass air was used. Near wall mixing within the fuel port resulted in decreased combustion efficiency. The use of bypass air resulted in decreased combustion efficiency for plexiglas and increased combustion efficiency for HTPB based fuels. Radiation was incorporated into an existing finite difference computer model for the SFRJ combustion process and resulted in improved predictive capabilities. Author (GRA)

N81-25241# Army Armament Research and Development Command, Dover, N. J. Large Caliber Weapon Systems Lab.
EVALUATION OF PROPELLANT EROSIVITY WITH VENTED EROSION APPARATUS Final Report
A. J. Bracuti, L. Bottei, J. A. Lannon, and L. H. Caveny Mar. 1981 48 p refs
(DA Proj. 1L1-62603-AH-18)
(AD-A098655; AD-E400584; ARLCD-TR-80017) Avail: NTIS HC A03/MF A01 CSCL 19/1

Gun steel erosion studies were performed using three propellant types (double base, triple base, and RDX composite), each formulated to have isochoric flame temperatures of approximately 2700 K, 3000 K, and 3300 K, respectively. These erosion studes were performed independently at ARRADCOM and Princeton University in different erosion vent apparatuses. The nitramine composite propellants in the 280 MPa regime were the most erosive at all flame temperatures. Within a propellant type, erosivity increased with flame temperature. The two erosion apparatuses gave similar results, but where differences occurred, no explanation was available. GRA

N81-25242# Ballistic Research Labs., Aberdeen Proving Ground, Md.
TRANSIENT COMBUSTION CALCULATIONS WITH VARIABLE THERMAL PROPERTIES
Carl W. Nelson Feb. 1981 26 p refs
(DA Proj. 1L1-61102-AH-43)
(AD-A098657; AD-E430596; ARBRL-TR-02294) Avail: NTIS HC A03/MF A01 CSCL 21/2

The response of solid propellant combustion to steep pressurization pulses has been calculated with consideration of temperature dependent thermal properties of the solid and quasi-steady gas phase. Response has been calculated for a uniformly distributed gas phase reaction and for the Zeldovich heat feedback theory with variations in surface heat release, pressurization rate, and thermal properties of the solid. Regression rate excursions of two to three times the quasi-steady rate are calculated for nominal values of propellent properties. For pressurization rates approximating calculated DDT rates, the excursions survive at high pressure. Higher assumed surface heat release produces sharper response in the distributed flame models. The Zeldovich approach predicts protracted excursions from quasi-steady behavior. GRA

N81-25243# Exxon Research and Engineering Co., Bayton, Tex.
EXXON CATALYTIC COAL-GASIFICATION PROCESS Quarterly Technical Progress Report, Oct. - Dec. 1979
Mar. 1980 73 p refs
(Contract DE-AC01-78ET-13005)
(DOE/ET-13005/T2) Avail: NTIS HC A04/MF A01

Work continued on the catalyst recovery screening studies to evaluate the economic impacts of alternative processing approaches and solid liquid separation current water washing using rotary drum filters for the solid liquid separations. Material and energy balances were completed for an alternative methane recovery process configuration using low pressure stripping which requires 26 percent less horsepower than the Study Design system. A material and energy balance computer model for the CCG reactor system was completed. The new model will provide

accurate, consistent and cost efficient material and energy balances for the extensive laboratory guidance and process definition studies planned. DOE

N81-25244# Bituminous Coal Research, Inc., Monroeville, Pa.
COMBINED SHIFT AND METHANATION IN A FLUIDIZED-BED REACTOR Final Report, 25 Sep. 1979 - 31 Dec. 1980
Robert C. Streeter Feb. 1981 137 p refs
(Contract DE-AC21-97ET-14815)
(DOE/ET-14815/20; BCR-L-1182) Avail: NTIS HC A08/MF A01

The feasibility of employing a gas phase, catalytic, fluidized bed reactor to carry out the water-gas shift and methanation reactions simultaneously, was demonstrated without product gas recycle. The major portion of the work involved PEDU scale tests in a 6-inch ID reactor, operating at 1000 psig and temperatures in the range of 900 to 10000 F, with a nominal catalyst charge of one cubic foot. These tests included operation for extended time periods (35 to 40 hours) with feed H2:CO ratios of 2:1 in the absence of steam, and 1:1 using steam:gas ratios of 0.1:1 to 0.2:1. Five different catalysts were evaluated. Bench-scale tests, each of approximately 10 days' duration, were also conducted. At 11000 F, however, considerable carbon formation did occur, possibly due to the onset of CH4 pyrolysis. At H2:CO = 1:1 and 9500 F, carbon deposition took place readily in the absence of steam. Small amounts of steam in the feed (e.g., steam:gas ratio = 0.1:1) were effective in inhibiting carbon formation, although larger amounts (steam:gas ratio = 0.5:1) resulted in deactivation and loss of metal surface area through sintering. DOE

N81-25245# Argonne National Lab., Ill. Energy and Environmental Systems Div.
ENERGY AND MATERIALS FLOWS IN THE PRODUCTION OF LIQUID AND GASEOUS OXYGEN
Sin-yan Shen and Alan M. Wolsky Aug. 1980 64 p refs
(Contract W-31-109-eng-38)
(ANL/CNSV-15) Avail: NTIS HC A04/MF A01

Liquid and gaseous oxygen is produced in an energy intensive air separation process that also generates nitrogen. More than 65% of the cost of oxygen is attributable to energy costs. Energy use and materials flows are analyzed for various air separation methods. Effective approaches to energy and material conservation in air separation plants include efficient removal of contaminants (carbon dioxide and water), centralization of air products user-industries so that large air separation plants are cost effective and the energy use in transportation is minimized, and increased production of nitrogen. Air separation plants have the capability to produce more than three times more nitrogen than oxygen, but present markets demand, at most, only 1.5 times more. Full utilization of liquid and gaseous nitrogen should be encouraged, so that the wasted separation energy is minimized. There are potential markets for nitrogen in, for example, cryogenic separation of metallic and plastic wastes, cryogenic particle size reduction, and production of ammonia for fertilizer. DOE

N81-25246# Michigan Univ., Ann Arbor.
PRELIMINARY EVALUATION OF HMX EXPLOSIVES WITH KRATON G BINDER, PROCESS DEVELOPMENT ENDEAVOR NO. 101
Thomas L. Stallings, A. Gordon Osborn, Herbert D. Johnson, and Jim A. Crutchmer Apr. 1981 12 p refs
(Contract DE-AC04-76DP-00487)
(MHSMP-81-17) Avail: NTIS HC A02/MF A01

The physical properties and sensitivity were evaluated for two HMX plastic bonded explosives containing Kraton G 1650 binder. Both explosives were less sensitive in the skid test than LX-14 and LX-10 and close to the same sensitivity as PBX 9501. Physical properties were measured before and after accelerated aging. Both showed an increase in stress and a decrease in strain after aging. DOE

N81-25247# Sandia Labs., Albuquerque, N. Mex. In Situ Technologies Div.
APPLICATIONS OF RESERVOIR SIMULATION TO IN SITU COAL GASIFICATION
R. E. Glass Mar. 1981 18 p refs
(Contract DE-AC04-76DP-00789)
(SAND-80-2579) Avail: NTIS HC A02/MF A01

The results of the Hanna 4B in situ coal gasification test suggest a relationship between the preignition high permeability zones and the subsequent flame front propagation. The problem of the effect of nonuniform permeability on the air flow patterns in a water saturated coal seam is addressed. Specifically, the nonuniformities addressed are those caused by: (1) the existence of horizontal high permeability zones in an otherwise homogeneous, isotropic coal; (2) the change in permeability and flow path caused by well completions and location; and (3) the existence of orthotropic permeability. The results indicate that the most favorable condition for reverse combustion linking in underground coal gasification exists when the process wells are aligned with the high permeability direction of an orthotropic coal. The results also demonstrate the importance of proper well completion. DOE

N81-25248# Sandia Labs., Albuquerque, N. Mex. In Situ Process Div.
INSTRUMENTATION AND PROCESS CONTROL DEVELOPMENT FOR IN SITU COAL GASIFICATION Quarterly Report, Jul. - Sep. 1980
Stanley E. Love, ed. Mar. 1981 27 p refs
(Contract DE-AC04-76DP-00789)
(SAND-80-2878) Avail: NTIS HC A03/MF A01

The results of calculations made to determine the influence of various permeability structures on reverse combustion linkage for UCG and the results of heavy oil fireflood mapping by the controlled source audio magnetotelluric (CSAMT) method proposed for UCG process mapping are described. A two phase, two dimensional reservoir model called RESEV was used for the permeability effects work: the results indicate that high permeability horizontal zones, well completion and separation, and orthotropic permeability all have significant influence on the success of reverse combustion linkage. Specific conclusions are made which emphasize the need for careful site characterization and for proper well completions. Regarding the second activity, CSAMT-derived resistivity maps provided good descriptions of the progress of the fireflood, which is being conducted by BETC near Bartlette, Ks. The combustion front apparently did not proceed in a uniform, radial manner. DOE

N81-25249# Dynatech R/D Co., Cambridge, Mass.
LIQUID FUELS PRODUCTION FROM BIOMASS
P. F. Levy, J. E. Sanderson, E. Ashare, D. L. Wise, and M. S. Molyneaux 30 Jun. 1980 126 p refs
(Contract DE-AC02-77ET-20050)
(DOE/ET-20050/T4) Avail: NTIS HC A07/MF A01

The production of liquid hydrocarbon fuels from biomass is discussed. Fermentation processes for the conversion of cellulosic substrates to yield high aliphatic organic acids are addressed along with methods of producing fuels from these acids including pyrolysis and Kolbe electrolysis. In addition, the design of a 100 lb/day facility is discussed and the economic factors of the process are analyzed. DOE

N81-25250# Bituminous Coal Research, Inc., Monroeville, Pa.
TEST AND EVALUATE THE TRI-GAS LOW-BTU COAL-GASIFICATION PROCESS Final Report, 21 Oct. 1977 - 31 Oct. 1980
M. G. Zabetakis Dec. 1980 81 p refs
(Contract DE-AC21-78ET-10254)
(DOE/ET-10254/88) Avail: NTIS HC A05/MF A01

The process consists of three fluid bed reactors in series, each having a specific function: stage 1, pretreatment; stage 2, gasification; and stage 3, maximization of carbon utilization. Fifty-nine process and equipment development unit (PEDU) tests were conducted. Both Rosebud and Pittsburgh seam coals were gasified with the PEDU operating in the design mode. Operation with Illinois No. 6 seam coal was also very promising. One of the crucial tasks was to operate the Stage 1 reactor to pretreat and devolatilize caking coals. By adding a small amount of air to the fluidizing gas, the caking properties of the coal can be eliminated. However, it was also desirable to release a high percentage of the volatile matter from the coal in this vessel. In order to accomplish this, the reactor had to be operated above the agglomerating temperature of caking coals. By maintaining

a low ratio of fresh to treated coal, this objective was achieved. Both Illinois No. 6 and Pittsburgh seam coals were treated at temperatures of 800 to 900 F without agglomerating in the vessel. DOE

N81-25251# Argonne National Lab., Ill. Environmental-Control Technology Program Dept.
COAL-OIL-MIXTURE TECHNOLOGY: A STATUS REPORT
J. A. Lecky Oct. 1980 54 p refs
(Contract W-31-109-eng-38)
(ANL/ECT-TM-3) Avail: NTIS HC A04/MF A01

The state of the technology in the field of coal-oil-mixture combustion is assessed. Several environmentally acceptable methods are characterized and assessed in terms of performance, costs, applicability, availability, and resource requirements. Consideration is also given to indirect environmental impacts that are either known or foreseeable. R.C.T.

N81-25252# Los Alamos Scientific Lab., N. Mex.
THERMAL HAZARDS OF EXPLOSIVES
Raymond N. Rogers Mar. 1981 4 p
(Contract W-7405-eng-36)
(LASL-81-9) Avail: NTIS HC A02/MF A01

Small scale methods for determining the reaction rates of explosives were developed that make it possible to predict safe temperatures for using them. Methods for testing the accuracy of these predictions were also devised. Each different size and shape of each different explosive has its own critical temperature. The ability to predict these critical temperatures is required before high energy materials can be used safely. DOE

N81-25253# Mitre Corp., McLean, Va.
IMPACT OF DEVELOPING TECHNOLOGY ON INDIRECT LIQUEFACTION
David Gray, Milton Lytton, Martin Neuworth, and Glen Tomlinson Nov. 1980 256 p refs
(Contract EF-77-C-01-2783)
(DOE/ET-10280/T1; MTR-80W326) Avail: NTIS HC A12/MF A01

The status of commercial technology for indirect liquefaction is reviewed. The impact of substituting more advanced gasifiers and synthesis systems is investigated. Slagging BGC/Lurgi, Texaco, and Shell-Koppers gasifiers were substituted for the Dry Ash Lurgi units and SASOL SYNTHOL synthesis units were replaced by slurry phase Fischer-Tropsch units. The advanced systems were found to have a highly favorable impact on plant efficiency, product distribution, and gasoline cost. If all the projected technical improvements can be realized for indirect liquefaction, the yields of refined transportation fuels per ton of coal will approach those anticipated for direct liquefaction processes. DOE

N81-25254# Los Alamos Scientific Lab., N. Mex.
THERMOCHEMICAL PROCESSES FOR HYDROGEN PRODUCTION Progress Report, 1 Oct. 1979 - 30 Sep. 1980
C. M. Hollabaugh, comp. Mar. 1981 20 p refs
(Contract W-7405-eng-36)
(LA-8675-PR) Avail: NTIS HC A02/MF A01

The work consists of experimental and engineering research to define cycles that can be coupled feasibly to high temperature heat sources for water splitting to produce hydrogen and oxygen. In recent months, our efforts were directed toward improving the design and operation of our 1 in diam laboratory scale quartz rotary kiln. Our results from the decomposition of bismuth oxysulfate in the kiln shows the technical feasibility of solid sulfate decomposition in a flow mode with recycled feed in residence times less than 2 min. Other work included (1) engineering studies than compared the published estimates of capital costs and process efficiencies for hydrogen production by thermochemical means and by electrolysis, (2) coordination of US contributions to the annual International Energy Agency Technical Workshop on Thermochemical Processes. DOE

N81-25255# Department of Energy, Bartlesville, Okla. Energy Technology Center.
AVIATION TURBINE FUELS 1980
Ella Mae Shelton Mar. 1981 14 p refs
(DOE/BETC/PPS-81/2) Avail: NTIS HC A02/MF A01

Properties of some aviation turbine fuels marketed in the United States during 1980 are presented. The samples represented are typical 1980 production and were analyzed in the laboratories of 17 manufacturers of aviation turbine (jet) fuels. The data were submitted for study, calculation, and compilation under a cooperative agreement between the Department of Energy (DOE), Bartlesville Energy Technology Center (BETC), Bartlesville, Oklahoma, and the American Petroleum Institute (API). Results for the properties of 98 samples of aviation turbine fuels are included in the report for military grades JP-4 and JP-5 and commercial type Jet A. DOE

N81-25256# Alternate Energy Associates, Inc., Pittsburgh, Pa.
SMALL WASTE TO ETHANOL PLANTS, PHASE 1
George F. Huff and M. Clark Fogle Sep. 1980 28 p refs
Sponsored by National Alcohol Fuels Commission
(PB81-160293; NAFC-80-15) Avail: NTIS HC A03/MF A01
CSCL 21D

A study is presented of the economics of the conversion of waste cellulose to ethanol through enzyme hydrolysis developed at three production levels: one million, five million, and ten million gallons per year of motor grade alcohol. The feedstock is the combustible portion of MSW and a nearby waste separation plant is assumed. It is also assumed that the alcohol plant is located inside the fence of an existing operating facility where steam and other utilities and services are available for purchase. No credit is taken for the protein by-product of the fermentation process; it is dried and used as boiler fuel or the parent plant. Study results indicate none of these plants to be competitive without a substantial subsidy. The enzyme technology is too capital intensive to be suitable for small plants. GRA

N81-25257# National Alcohol Fuels Commission, Washington, D.C.
LEGISLATIVE COMPENDIUM: ALCOHOL FUELS (96TH CONGRESS)
14 Apr. 1980 33 p
(PB81-153876; NAFC-80-11) Avail: NTIS HC A03/MF A01
CSCL 21D

A complete listing of all legislation introduced during the first 16 months of the 96th Congress on the subject of alcohol fuels and biomass energy. Including more than 120 bills, each entry includes: bill title; sponsor and certain co-sponsors; date of introduction; committee referred to; a listing of the major provisions; the federal agencies affected by the bill; and a brief history of Congressional action on the bill through April 14, 1980. All bills are cross referenced on subjects such as: financial assistance; research and development; federal use of gasohol; and tax incentives. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N81-25258* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LIGHTWEIGHT STRUCTURAL COLUMNS Patent
Harold G. Bush, inventor (to NASA) Issued 7 Apr. 1981 9 p
Filed 29 Jun. 1977 Supersedes N77-27432 (15 p 2393)
(NASA-Case-LAR-12095-1; US-Patent-4,259,821;
US-Patent-Appl-SN-811401; US-Patent-Class-52-309.1;
US-Patent-Class-52-648; US-Patent-Class-52-726;
US-Patent-Class-244-158R; US-Patent-Class-403-171;
US-Patent-Class-428-902) Avail: US Patent and Trademark Office CSCL 13B

Lightweight half-lengths of columns for truss structures are described. The columns are adapted for nestable storage and transport to facilitate fabrication of large area truss structures at a remote site and particularly adaptable for space applications. Official Gazette of the U.S. Patent and Trademark Office

N81-25259* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FOLDABLE BEAM Patent

John M. Hedgepeth (Astro Research Corp., Carpinteria, Calif.), John V. Coyner (Astro Research Corp., Carpinteria, Calif.), and Robert F. Crawford (Astro Research Corp., Carpinteria, Calif.) *Issued 7 Apr. 1981 8 p Filed 23 Feb. 1979 Supersedes* N79-25425 (17 - 16, p 2136) Sponsored by NASA (NASA-Case-LAR-12077-1; US-Patent-4,259,825; *US-Patent-Appl-SN-014663; US-Patent-Class-52-645)* Avail: US Patent and Trademark Office CSCL 13I

A foldable beam possessing superior qualities of light weight, *compactness for transportation,* quick deployment with minimum use of force, and high strength is described. These qualities are achieved through the use of a series of longitudinally *rigid* segments, hinged along one side and threaded by one or two cables along the opposite side. Tightening the cables holds the beam extended. *Loosening the cables permits the segments to* fold away from the threaded side. In one embodiment the segments are connected by canted hinges with the result that *the beam may be folded in a helix-like configuration around a* cylinder. In another embodiment the segments themselves may be hinged to fold flat laterally as the beam is folded, resulting *in a configuration that may be helixed around a shorter* cylinder.

Official Gazette of the U.S. Patent and Trademark Office

N81-25260 Stanford Univ., Calif.

PROBABILISTIC AND HAZARD ANALYSIS FOR PORE PRESSURE INCREASE IN SOILS DUE TO SEISMIC LOADING Ph.D. Thesis

Jean-Lou Aristide Chameau 1981 244 p
Avail: Univ. Microfilms Order No. 8108903

The damage potential associated with pore pressure increases *in saturated cohesionless soils under seismic loading was assessed.* Specific objectives was given to: (1) developing procedures to evaluate the likelihood of pore pressure build up during an *earthquake; (2) assessing the probability of* ground deformation and damage caused by the pore pressure build up; and (3) evaluating the resulting potential for economic loss.

Dissert. Abstr.

N81-25261*# National Aeronautics and Space Administration, Washington, D. C.

REPORT ON OCCUPATIONAL SAFETY AND HEALTH TO THE SECRETARY OF LABOR FOR CY 1980 Annual Report

1980 49 p refs
(NASA-TM-82357) Avail: NTIS HC A03/MF A01 CSCL 13L

Summary and evaluation of NASA occupational safety and health activities focus on: policy; personnel; funding. Training activities, inspection, record-keeping, and interagency activities are included. S.F.

N81-25262*# FMC Corp., Chicago, Ill. Engineered Systems Div.

FOOD PACKING OPTIMIZATION Final Report

[1981] 17 p refs
(Contract NAS9-16064)
(NASA-CR-160993) Avail: NTIS HC A02/MF A01 CSCL 13H

The development of a universal closure lid for the space shuttle food package is reported. The revised lid needs a folded configuration which, when unfolded, fully conforms to the interior surfaces of the food cup. Experimental thermoform molds were fabricated and test lids formed. The lid material not in contact with the food conformed to the cup interior without wrinkles, permitting full nesting of the cups. The final lid design was established and thermoform tooling designed and fabricated. Lids formed on these molds were tested for strength. The heating elements were replaced and repositioned to eliminate any hot spots which may cause warpage. E.A.K.

N81-25263*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SAFETY MANAGEMENT OF COMPLEX RESEARCH OPERATORS

William J. Brown 30 Jul. 1981 20 p refs Proposed for presentation at the 5th Intern. System Safety Conf., Denver, 30 Jul. 1981 (NASA-TM-81772; E-832) Avail: NTIS HC A02/MF A01 CSCL 13L

Complex research and technology operations present varied potential hazards which are addressed in a disciplined, independent safety review and approval process. Potential hazards vary from high energy fuels to hydrocarbon fuels, high pressure systems to high voltage systems, toxic chemicals to radioactive materials and high speed rotating machinery to high powered lasers. A *Safety Permit System presently covers about 600 potentially* hazardous operations. The Safety Management Program described is believed to be a major factor in maintaining an excellent *safety record.* S.F.

N81-25264# Naval Ocean Systems Center, San Diego, Calif.

***THE JACK-IN-THE-BAG FIXED VOLUME LIFT DEVICE* Final Report**

R. W. Buecher Feb. 1981 11 p
(AD-A096564; NOSC/TR-657) Avail: NTIS HC A02/MF A01 CSCL 13/3

The operating principles of the Jack-in-the-Bag *fixed volume lift* device are described. A description, operating instructions, and test results for the 500 pound capacity prototype are *presented.* *Author*

N81-25265# Sonobond Corp., Westchester, Pa.

***REMOVAL OF BOUND METAL FASTENERS* Final Report, Sep. 1979 - Dec. 1980**

Richard F. Kramer Washington Naval Sea Systems Command *Apr. 1981 27 p*
(Contract N00140-79-C-1173)
(AD-A098585; Rept-80-6; NAVSEA-MT-S359-79) Avail: NTIS *HC A03/MF A01* CSCL 13/9

This project explored the removal of bound metal fasteners through the use of ultrasonically assisted wrenches. Two wrenches were designed, fabricated and tested. Previous studies had indicated an increase in thread tension for a given torque *application under the influence of ultrasonics.* Based on this, the loosening of seized and corroded fasteners with the aid of ultrasonics was explored. Experimental data confirmed our prior *analysis of the torque-tension relationship under the influence* of ultrasonics; however, our progress did not satisfy the requirements necessary to loosen seized studs in a shipyard *environment.* Author (GRA)

N81-25266# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.

THE BEHAVIOR OF BONDED DOUBLER SPLICES FOR COMPOSITE SANDWICH PANELS Interim Report

Thomas A. Zeller and Terry A. Weisshaar Jul. 1980 140 p refs
(Grants NCC1-15; NGR-47-004-129)
(PB81-156481; VPI-E-80-20; IR-19) Avail: NTIS HC A07/MF A01 CSCL 13C

The results of an investigation into the behavior of adhesively bonded doubler splices of two composite material sandwich panels are presented. The splices are studied from three approaches: analytical; numerical (finite elements); and experimental. Several parameters that characterize the splice are developed to determine their influence upon joint strength. These parameters are: doubler overlap length; core stiffness; laminate bending stiffness; the size of the gap between the spliced sandwich panels; and room and elevated temperatures. Similarities and contrasts between these splices and the physically similar single and double lap joints are discussed. The results of this investigation suggest several possible approaches to improving the strength of the sandwich splices. GRA

N81-25267# California Univ., San Diego. Dept. of Applied Mechanics and Engineering Sciences.

PLANAR MECHANICS OF FULLY GROUTED CONCRETE MASONRY

Robert O. Nunn May 1980 127 p refs
(Grant NSF PFR-78-16581)
(PB81-155228; UCSD/AMES/TR-80-001; NSF/RA-800375) Avail: NTIS HC A07/MF A01 CSCL 13C

A continuum model for the planar behavior of fully grouted concrete masonry is developed from experimental data. Both unreinforced and reinforced masonry are treated. The form of

the elastic law, in values of the elastic moduli and the elastic damping constant are determined. Prism end conditions are discussed and uniaxial tensile strength direction dependence is described. A biaxial fracture law, applying when one principal stress in tensile, is presented, and a plasticity model for post fracture behavior or reinforced masonry is developed. Normality of the plastic strain rate is shown to hold at several points on the loading surface, and a stress rate total strain rate matrix for plastic behavior is derived. Many graphs, tables, and diagrams amplify the text. GRA

N81-25268# *South Dakota School of Mines and Technology,* Rapid City. Dept. of Civil Engineering.
SUPERPLASTICIZED CONCRETES FOR REHABILITATION *OF BRIDGE DECKS AND HIGHWAY PAVEMENTS Interim* Report, Aug. 1979 - Jul. 1980
V. Ramakrishnan and W. V. Coyle Jan. 1981 264 p refs
(Contract DOT-RC-92035)
(PB81-153447; SDSMT-CDT-805; DOT-RSPA-DPB-50-81-3) Avail: NTIS HC A12/MF A01 CSCL 13C

Two mixes, one with medium workability and high cement content suitable for bridge deck replacement and another with high workability suitable for structural and pavement concrete were selected for intensive study. For these mixes, properties of the fresh concrete (slump, vebe time, flow table spread, air *content, initial and final setting times) are reported. The effects* of retempering are described. The influence of three types of cements on the properties of plastic and hardened concrete is *explained. Complete results of the following tests are presented:* compressive strength, tensile strength, flexural strength, static modulus of elasticity, dynamic modulus of elasticity, pulse velocity and dry unit weight at 1, 3, 28 and 90 days curing. The selected concretes had high durability and satisfactory resistance against deicer scaling. GRA

N81-25269# Kerr (Robert S.) Water Research Center, Ada, Okla.
INDUSTRIAL REUSE AND RECYCLE OF WASTEWATERS: LITERATURE REVIEW Final Report
John E. Matthews Dec. 1980 210 p
(PB81-155145; EPA-600/2-80-183) Avail: NTIS HC A10/MF A01 CSCL 13B

The literature on reuse/recycle of wastewaters by industry is presented. The principal time period reviewed was 1967 to 1978. A total of 912 references are cited. The most prominant references for nine different industrial categories are cited. In addition, sections on industrial use of municipal wastewater, reclamation processes, and economics of water reuse/recycle are included. GRA

N81-25270# Earthquake Engineering Research Inst., Berkeley, Calif.
DYNAMIC RESPONSE OF EMBANKMENT, CONCRETE-GRAVITY AND ARCH DAMS INCLUDING HYDRODYNAMIC INTERACTION
John F. Hall and Anil K. Chopra Oct. 1980 242 p refs
(Grants NSF ATA-74-20554; NSF ENV-76-80073)
(PB81-152324; UCB/EERC-80/39; NSF/RA-800298) Avail: NTIS HC A11/MF A01 CSCL 13B

An analysis procedure in the frequency domain for determining the earthquake responses of a dam was developed. The procedure include hydrodynamic interaction and water compressibility effects. Linear responses of idealized, two dimensional gravity dams and three dimensional dams, including arch dams were obtained. For an infinite uniform region a finite element discretization provides for a proper transmission of pressure waves. Hydrodynamic effects are equivalent to an added mass and added load in the frequency domain equations of motion of the dam. Complex frequency response functions for acceleration at the dam crest are presented for two dimensional concrete gravity and earth dams and for a three dimensional arch dam. Water compressibility and fluid foundation interaction significantly influence the response of concrete gravity dams and are even more important for each dam. E.A.K.

N81-25271# Cal Recovery Systems, Inc., Richmond, Calif.
PROCESSING EQUIPMENT FOR RESOURCE RECOVERY SYSTEMS. VOLUME 3: FIELD TEST EVALUATION OF SHREDDERS Final Report
George M. Savage and Geoffrey R. Shiflett Jul. 1980 137 p refs 3 Vol.
(Contract EPA-68-03-2589; Proj. 4426-D)
(PB81-151557; EPA-600/2-80-007C) Avail: NTIS HC A07/MF A01 CSCL 13B

A program to test and evaluate large scale shredders used for the size reduction of solid waste is reported. Tests were *conducted on seven horizontal hammermills, one vertical* hammermill, and one vertical ring shredder at six commercial sites. Both two stage size reduction and single stage size reduction *were studied. Analytical relationships among the comminution* parameters and the establishment of levels of performance for energy consumption and hammer wear associated with size *reduction of solid waste are developed.* E.A.K.

N81-25272# National Bureau of Standards, Washington, D.C.
***REPORT OF THE NATIONAL CONFERENCE ON WEIGHTS* AND MEASURES, 1980**
Harold F. Wollin, ed., Louis E. Barbrow, ed., and Ann P. Heffernan, ed. Jan. 1981 319 p The 65th conf. was held in Washington, D.C., 23-27 Jun. 1980
(PB81-151656; NBS-SP-599; LC-26-27766) Avail: NTIS HC A14/MF A01 CSCL 14B

Major issues discussed at the National Conference on weights *and measures include measurement science education, enforce-*ment uniformity, national type approval, computers and microelectronics, new design and performance requirements for weighing *and measuring technology, radiation measurements, metric* conversion of retail gasoline dispensers, and weights and measures program evaluation. GRA

N81-25273# Texas Univ. at Austin. Structural Engineering Lab.
BEHAVIOR CLASSIFICATION OF SHORT REINFORCED CONCRETE COLUMNS SUBJECTED TO CYCLIC DEFORMATIONS
K. A. Woodward and J. O. Jirsa Jul. 1980 357 p refs
(Grant NSF ENV-77-20816)
(PB81-158222; PMFSEL-80-2; NSF/RA-800378) Avail: NTIS HC A16/MF A01 CSCL 13M

Guidelines were developed for describing and predicting the behavior of short reinforced concrete columns subjected to cyclic reversed deformations. The guidelines are presented in a flowchart encompassing a broad range of behavior. The end result is a unified approach to classifying and describing the hysteretic behavior of the columns. Eleven short columns were tested, the majority of which were subjected to cyclic deformations applied along two orthogonal axes. A constant compressive axial load was also applied to the majority of the columns. Results of the tests showed a wider range of behavioral characteristics than was expected. Based on test results, a predictive guide was developed to provide a rationale for understanding column behavior under cyclic loading conditions. GRA

N81-25274# Institute for Telecommunication Sciences and Aeronomy, Boulder, Colo.
FIELD MAXIMA INSIDE HABITABLE STRUCTURES EXPOSED TO 2.45 GHz PLANEWAVE RADIATION
Hans J. Liebe Oct. 1980 47 p refs
(PB81-155137; NTIA/Rept-80-49) Avail: NTIS HC A03/MF A01 CSCL 13L

Data needed to assess the potential of the satellite power system to cause microwave field enhancements (so called 'hot spots') inside habitable structures (house, trailer, car, etc.) located in the fringe area of the receiving rectenna are presented. Mitigative measures are included. GRA

N81-25275# General Services Administration, Washington, D.C.
TRANSFORMER ROOM FIRE TESTS Final Report
C. D. Fustich Mar. 1980 22 p
(PB81-154411; GSA/PBS-79-08) Avail: NTIS HC A02/MF A01 CSCL 13L

A series of transformer room fire tests are reported to demonstate the shock hazard present when automatic sprinklers operate over energized electrical equipment. Fire protection was provided by standard 0.5 inch pendent automatic sprinklers temperature rated at 135 F and installed to give approximately

150 sq ft per head coverage. A 480 v dry transformer was used in the room to provide a three phase, four wire distribution system. It is shown that the induced currents in the test room during the various tests are relatively small and pose no appreciable personnel shock hazard. E.A.K.

N81-25276# National Bureau of Standards, Washington, D.C. National Engineering Lab.
FOURTH ANNUAL CONFERENCE ON FIRE RESEARCH Final Report
Ileana M. Martinez, ed. and Sonya M. Cherry, ed. Dec. 1980 169 p refs Conf. held in Washington, D.C., 22-24 Oct. 1980 (PB81-158305; NBSIR-80-2127-1) Avail: NTIS HC A08/MF A01 CSCL 13L

Descriptions of the internal programs of the Center for Fire Research as well as extended abstracts of grants and contracts sponsored by the Center for Fire Research, National Bureau of Standards are provided. GRA

N81-25277# Resource Planning Associates, Inc., Washington, D. C.
ECONOMIC FEASIBILITY OF USING FLY ASH IN THE CERAMIC AND CONCRETE/CEMENT INDUSTRIES, MERCER COUNTY, NORTH DAKOTA
Jun. 1980 119 p refs Prepared for Mercer County Energy Development Board, Hazen, N. Dak.
(Contract DE-FG03-80CS-20028; Grant EDA-05-06-01878) (PB81-153918; EDA-81-019) Avail: NTIS HC A06/MF A01 CSCL 13H

Potential new industries for Mercer County were screened. Fly ash based products proved to be the industry that currently best fulfilled all three general objectives of the economic diversification plan. It could provide a new source of employment, conserve energy, resources, and provide a means to use a product that is currently discarded. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N81-25278* National Aeronautics and Space Administration. Pasadena Office, Calif.
MULTIFREQUENCY BROADBAND POLARIZED HORN ANTENNA Patent
Kenneth A. Green, inventor (to NASA) (Microwave Research Corp.) Issued 24 Mar. 1981 12 p Filed 31 Jan. 1979 Supersedes N79-17067 (17 - 08, p 0968) Sponsored by NASA
(NASA-Case-NPO-14588-1; US-Patent-4,258,366; US-Patent-Appl-SN-008209; US-Patent-Class-343-786; US-Patent-Class-343-755; US-Patent-Class-343-772; US-Patent-Class-343-781R) Avail: US Patent and Trademark Office CSCL 20N

A corrugated conical horn antenna is simultaneously fed a multiplicity of signals, two for each of five frequencies, with each of a pair of signals fed in each of two orthogonal planes for excitation of a desired spherical hybrid mode. The lowest frequency is fed into the horn through orthogonal pairs of colinear slots, each pair being fed by coaxial tee power dividers. Other signals are fed through a circular waveguide connected to the vertex. The highest frequency signals are fed through orthogonal ports near the far end of the circular waveguide. The intermediate frequency signals are fed through orthogonal ports spaced along the waveguide. Filtering is incorporated for each to maintain isolation and low insertion loss.
Official Gazette of the U.S. Patent and Trademark Office

N81-25279*# Motorola, Inc., Scottsdale, Ariz.
HYBRID RECEIVER CONCEPTUAL DESIGN AND TEST REPORT Final Report
Stephen W. Klare and James J. Crawford 31 May 1978 85 p refs
(Contract NAS2-9707)
(NASA-CR-152137) Avail: NTIS HC A05/MF A01 CSCL 17B

The Hybrid Receiver described uses an acquisition and demodulation scheme tailored to the Jovian environment. The large Doppler offsets expected during initial acquisition led to development of the Hilbert Acquisition Aid, which provides for rapid acquisition for low signal to noise densities. S.F.

N81-25280*# Novar Electronics Corp., Barberton, Ohio.
BEAT FREQUENCY INTERFERENCE PATTERN CHARACTERISTICS STUDY Final Report
James H. Ott and James S. Rice 20 Jan. 1981 102 p ref
(Contract NAS9-16055)
(NASA-CR-160958) Avail: NTIS HC A06/MF A01 CSCL 20N

The frequency spectra and corresponding beat frequencies created by the relative motions between multiple Solar Power Satellites due to solar wind, lunar gravity, etc. were analyzed. The results were derived mathematically and verified through computer simulation. Frequency spectra plots were computer generated. Detailed computations were made for the seven following locations in the continental US: Houston, Tx.; Seattle, Wa.; Miami, Fl.; Chicago, Il.; New York, NY; Los Angeles, Ca.; and Barberton, Oh. J.M.S.

N81-25281*# Radio Science Co., Melbourne, Fla.
NOISE AND INTERFERENCE STUDY FOR SATELLITE LIGHTNING SENSOR Final Report, Apr. 1980 - Apr. 1981
John R. Herman 6 May 1981 74 p refs
(Contract NAS8-33891)
(NASA-CR-161768; RSCR-81-2) Avail: NTIS HC A04/MF A01 CSCL 20A

The use of radio frequency techniques for the detection and monitoring of terrestrial thunderstorms from space are discussed. Three major points are assessed: (1) lightning and noise source characteristics; (2) propagation effects imposed by the atmosphere and ionosphere; and (3) the electromagnetic environment in near space within which lightning RF signatures must be detected. A composite frequency spectrum of the peak of amplitude from lightning flashes is developed. Propagation effects (ionospheric cutoff, refraction, absorption, dispersion and scintillation) are considered to modify the lightning spectrum to the geosynchronous case. It is suggested that in comparing the modified spectrum with interfering noise source spectra RF lightning pulses on frequencies up to a few GHz are detectable above the natural noise environment in near space. E.A.K.

N81-25282# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SPEECH TRANSFORMATION SYSTEM (SPECTRUM AND/OR EXCITATION) WITHOUT PITCH EXTRACTION
Stephanie Seneff 31 Jul. 1980 50 p refs
(Contract F19628-80-C-0002; ARPA Order 3673)
(AD-A097091; ESD-TR-80-90) Avail: NTIS HC A03/MF A01 CSCL 05/8

A speech analysis synthesis system was developed which is capable of independent manipulation of the fundamental frequency and spectral envelope of a speech waveform. The system deconvolved the original speech with the spectral envelope estimate to obtain a model for the excitation, explicit pitch extraction was not required and as a consequence, the transformed speech was more natural sounding than would be the case if the excitation were modeled as a sequence of pulses. It is shown that the system has applications in the areas of voice modifications, baseband excited vocoders, time scale modifications, and frequency compression as an aid to the partially deaf. R.C.T.

N81-25283# Zeger-Abrams, Inc., Glenside, Pa.
HIGH POWER BROADBAND CANCELLATION SYSTEM Final Report, 15 May 1979 - 30 Oct. 1980
Lee D. Wismer and Burton S. Abrams Mar. 1981 64 p refs
(Contract F30602-79-C-0180; AF Proj. 2338)
(AD-A098107; RADC-TR-81-15) Avail: NTIS HC A04/MF A01 CSCL 09/5

The objective of this report is to improve the broadband cancellation technology associated with adaptive UHF (225-400 MHz) Interference Cancellation Systems (ICS) employed with tunable or hopping transmitters. More specifically, the objective is to cancel a narrowband transmitter waveform centered at a

frequency f sub o plus its noise and modulation sidebands that extend over plus or minus 0.02% of f sub o. This report describes the concept for a two-channel ICS which provides improved broadband cancellation compared to that achievable with a single-channel ICS. The input to the second-channel weight is spectrally pre-shaped by an adaptive notch filter which automatically tracks the frequency of the interference. Control of the second-channel weight utilizes a novel pilot-directed control system. A functioning unit was constructed to implement the design concept. Experimental measurements of the unit's performance across the 225 to 400 MHz band are presented which show f sub o cancellation averaging about 60 dB, and sideband cancellation (at f sub o plus or minus 85 KHz) averaging almost 55 dB. The settling time is less than 20 milliseconds. Suggestions for design refinements and for more extensive testing of the unit are discussed. GRA

N81-25284# Defense Communications Agency, Arlington, Va.
ARPANET INFORMATION BROCHURE Final Report
May 1980 30 p
(AD-A096798; AD-E100408; DCA-1) Avail: NTIS HC A03/MF A01 CSCL 09/2

ARPANET is an operational, resource sharing intercomputer network linking a wide variety of computers in the continental United States, Hawaii, Norway, and England. Its communications system introduced the revolutionary technique of packet switching where each message is broken up into small packets and each packet is switched to its destination over the quickest communications path available at any given instant. A general description of the ARPANET and the policies and procedures governing its use are defined. S.F.

N81-25285# Lincoln Lab., Mass. Inst. of Tech., Lexington. Group 61.
RAIN-OUTAGE REDUCTION BY DATA STORAGE IN EHF SATCOM SYSTEMS
Robert P. Rafuse 25 Nov. 1980 78 p refs
(Contract F19628-80-C-8082)
(AD-A096719; ESD-TR-80-236; DCA-10) Avail: NTIS HC A05/MF A01 CSCL 17/2

By using statistical long term attenuation and fade duration probability distributions gathered at several frequencies and geographic locations, an empirical model for determining the improvement in effective availability created by a given amount of storage time is developed. The model is applicable to all geographical areas where standard climatological data is gathered. S.F.

N81-25286# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
QUALITATIVE DESCRIPTION OF OBSCURATION FACTORS IN CENTRAL EUROPE Final Report
Marvin D. Kays, Mary Ann Seagraves, Hubert H. Monaher, and Robert A. Sutherland Sep. 1980 123 p refs
(AD-A094145; ERADCOM/ASL-MONO-4) Avail: NTIS HC A06/FM A01 CSCL 20/14

The obscuration factors that affect electro-optical systems are described. The obscuration factors are classified into four categories: clear atmosphere; natural obscurants; battlefield obscurants; and land/air interface. Basic radiation laws, Rayleigh and Mie scattering, and the changes that a beam of electromagnetic energy encounters in an atmosphere free from clouds and obstructions to visibility are discussed. The effects of fog, rain, snow, drizzle, clouds, haze, and dust storms upon electro-optical systems are discussed. Battlefield obscurants are dust, smoke, and fire resulting from battle and intentional smoke. Land/air interface includes the effect of terrain, vegetation, and ground cover upon obscuration. S.F.

N81-25287# Harry Diamond Labs., Adelphi, Md.
POST-TUNED MICROSTRIP ANTENNAS FOR FREQUENCY-AGILE AND POLARIZATION-DIVERSE APPLICATIONS
Daniel H. Schaubert, Frederick G. Farrar, Arthur R. Sindoris, and Scott T. Hayes Mar. 1981 32 p refs
(AD-A098707; HDL-TM-81-8) Avail: NTIS HC A03/MF A01 CSCL 09/5

A technique is investigated for controlling the operating frequency and polarization of microstrip antennas. The control is achieved by the placement of shorting posts at appropriate locations within the antenna's boundaries. By changing the number and locations of the posts, the operating frequency can be tuned over a 1.5 to 1 range, and the polarization can be changed from horizontal to veritical, right-hand circular, or left-hand circular. All these changes are obtained without significantly altering the input impedance or radiation patterns of the antenna and without increasing the complexity of the external microwave feed network. Also, the frequency and polarization can be electronically controlled by the use of microwave switching diodes for the shorting posts. Antennas that have two feeds and operating simultaneously in two orthogonal polarizations have been constructed with the capability to switch between linear and circular polarizations. Also, a thin, frequency-scanned array has been built with the frequency-agile microstrip elements. GRA

N81-25288# Lincoln Lab., Mass. Inst. of Tech., Lexington. Group 91.
THE DIGITAL SIGNAL PROCESSOR FOR THE ALCOR MILLIMETER WAVE RADAR
Robert A. Ford 6 Nov. 1980 66 p
(Contract F19628-80-C-0002)
(AD-A098521; TN-1980-51; ESD-TR-80-221) Avail: NTIS HC A04/MF A01 CSCL 17/9

This report describes the use of an array processor for real time radar signal processing. Pulse compression, range marking, and monopulse error computation are some of the functions that will be performed in the array processor for the millimeter wave ALCOR radar augmentation. Real time software design, processor architecture, and system interfaces are discussed in the report. Author (GRA)

N81-25289# Naval Postgraduate School, Monterey, Calif.
A DIGITALLY TUNED AM/FM RADIO M.S. Thesis
Dogan Ozdemir and Nuretin Bal Dec. 1980 87 p refs
(AD-A098484) Avail: NTIS HC A05/MF A01 CSCL 17/2

This report describes the design and operation of a relatively economical, single crystal, frequency synthesizer that generates the required local oscillator frequencies for commercial AM and FM broadcast receivers. Selection of a desired station is accomplished by electronic programming using pushbutton control. Fine tuning is not necessary. Receiver frequency drift is not significant because the local oscillator frequency is crystal controlled. Low-cost medium-scale integrated circuits and a large-scale integrated circuit (LSI) are the building blocks of this synthesizer. Frequency synthesis techniques, elements of the system design and experimental results are also presented.
Author (GRA)

N81-25290# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
SCINTILLATION FADING SIMULATION Final Report, Nov. 1977 - Dec. 1979
Wade T. Hunt Mar. 1981 34 p refs
(AF Proj. 1227)
(AD-A098498; AFWAL-TR-80-1187) Avail: NTIS HC A03/MF A01 CSCL 17/2

It is difficult to determine the long term effects of ionospheric scintillation on a particular modulation/coding scheme since the scintillation characteristics change rapidly. In order to measure the effect of the scintillation fading on the acquisition time, it would be necessary to repeat the acquisition test several hundred times. Since the acquisition of a modem such as the Dual UHF modem may take 1 to 5 minutes, it would be necessary to have scintillation fading for a period of 4 to 8 hours. The alternative is to record the UHF signal level of a simulator and reproduce a short segment of fading over and over again. This was done using the Avionics Laboratory Communication Systems Evaluation Laboratory (CSEL). Author (GRA)

N81-25291# Army Training and Doctrine Command, Fort Monroe, Va.
LETTER REQUIREMENT (LR) FOR DIRECTIONAL LOG PERIODIC ANTENNA (OE-314)
1 Apr. 1981 14 p
(AD-A098720) Avail: NTIS HC A02/MF A01 CSCL 09/5

A need exists for directional broadband VHF antenna for use within the 30-88 MHz frequency band during the 1981-1991

time frame with an IOC of May 1982. These antennas will provide an extended range capability for radio nets throughout the entire Army while reducing the radio frequency (RF) output power requirements and providing a degree of Electronic Counter-Counter Measure (ECCM) protection to the tactical radio system. This directional antenna is intended for use with both current VHF-FM tactical net radios (VRC-12/PRC-77/PRC-25 series) and subsequently with the Single Channel Ground Airborne Radio Subsystems-VHF (SINCGARS-V) radios. Author (GRA)

N81-25292# Ohio State Univ., Columbus. ElectroScience Lab.

THE TRIPOLE ANTENNA: AN ADAPTIVE ARRAY WITH FULL POLARIZATION FLEXIBILITY

R. T. Compton, Jr. Dec. 1980 36 p refs
(Contract N00019-80-C-0181)
(AD-A098345; ESL-712684-6) Avail: NTIS
HC A03/MF A01 CSCL 09/4

The performance of an adaptive array using three mutually perpendicular dipoles (a tripole) was studied. A desired signal and an interference signal, each with arbitrary angle of arrival and polarization, are assumed incident on the array. Uncorrelated thermal noise is also assumed present on each element signal. The output desired signal-to-interference-plus-noise ratio (SNIR) is computed as a function of the signal arrival angles and polarizations. It is shown that, for most angles of arrival and polarizations, the array has an excellent ability to protect a desired signal from interference. Certain special cases where the performance is not good are discussed in detail. Author (GRA)

N81-25293# Naval Underwater Systems Center, Newport, R.I. Combat Control Systems Dept.

SPEECH SYNTHESIS FROM UNRESTRICTED TEXT USING A SMALL DICTIONARY B.S. Thesis - MIT, Jun. 1980

Richard Loose 10 Feb. 1981 28 p refs
(AD-A096883; NUSC-TR-6423) Avail: NTIS
HC A03/MF A01 CSCL 09/2

Present voice synthesis systems have either used a large dictionary to look up words to be voiced, or have used only letter-to-sound rules resulting in monotone speech. The SIMON systems utilizes the morphographemic analysis aspect of the large systems, while relying on letter-to-sound rules for the translation of morpheme to morph. The result is a system which produces inflected speech without the storage requirements of a large dictionary. E.A.K.

N81-25294# National Telecommunications and Information Administration, Boulder, Colo. Inst. for Telecommunication Sciences.

MEASUREMENTS OF ELECTROMAGNETIC NOISE RADIATED FROM AUTOMOTIVE IGNITION SYSTEMS

Robert J. Matheson Nov. 1980 40 p refs
(PB81-153611; NTIA/Rept-80-54) Avail: NTIS
HC A03/MF A01 CSCL 20N

Measurements of the amplitude probability distributions and the average crossing rates of the electromagnetic noise radiated by automotive ignition systems were made at 30 MHz, 47 MHz, 147 MHz, 224 MHz and 445 MHz. The ignition noise from a single car and a 12 car matrix were each measured in a 10 kHz bandwidth, using a field intensity meter, a DM-4, a desktop calculator, and an X-Y plotter. The DM-4 is an instrument built by NTIA to measure amplitude probability distributions and average crossing rates. Numerical integration of the amplitude probability distributions was used to determine the rms, the average, and the average logarithm of the envelope of the measured noise. GRA

N81-25295# Institute for Telecommunication Sciences and Aeronomy, Boulder, Colo.

SPECTRUM RESOURCE ASSESSMENT IN THE 902-928 MHz BAND

Bohdan Bulawka Sep. 1980 99 p refs
(PB81-155160; NTIA/Rept-80-46) Avail: NTIS
HC A05/MF A01 CSCL 17B

A spectrum resource assessment for the 902-928 MHz band is presented. Information on allocations, technical standards, frequency assignments, system characteristics, and a review of applicable compatibility analysis are included. Three problem areas affecting U.S. Government usage of the band are identified and studied. One area deals with providing spectrum support in the 900 MHz region for a new fixed service while the other issues deal with the impact of ISM operation and restricted radiation devices on current users. GRA

N81-25296# Institute for Telecommunication Sciences and Aeronomy, Boulder, Colo.

THE COVERAGES OF THE MF AND VHF MARITIME DISTRESS COMMUNICATION SYSTEMS

William A. Kissick Oct. 1980 153 p refs
(PB81-155129; NTIA/Rept-80-52) Avail: NTIS
HC A08/MF A01 CSCL 17B

The radio coverage for two maritime distress communication systems are calculated for those U.S. Coast Guard stations in the contiguous United States. The two systems are the international MF distress channel and the international VHF distress channel. The predicted coverage for each station is shown as a contour drawn on a map background. GRA

N81-25297# Institute for Telecommunication Sciences and Aeronomy, Boulder, Colo.

VIDEOTEX SYSTEMS AND SERVICES

L. R. Bloom, A. G. Hanson, R. F. Linfield, and D. R. Wortendyke Oct. 1980 168 p refs
(PB81-153512; NTIA/Rept-80-50) Avail: NTIS
HC A08/MF A01 CSCL 17B

A consumer-oriented family of innovative information distribution services, generally termed VIDEOTEX, being offered to the European and Japanese public is discussed. Normally using a modified home TV receiver as the display terminal, services provide user access to broad varieties of computerized data banks. Distribution to the user is typically via broadcast TV (one way services) or the switched telephone network (two way, interactive services). Also, there exists hybrid services in which the requested service may be transmitted over a different medium from the received information. Representative services and distribution system architectures, potential impact on the telephone network, the need for and status of standards, and economic considerations for user and suppliers are also discussed. GRA

N81-25298# Federal Communications Commission, Washington, D. C. Office of Plans and Policy.

POLICIES FOR REGULATION OF DIRECT BROADCAST SATELLITES Final Staff Report

Florence O. Setzer, Bruce A. Franca, and Nina W. Cornell Sep. 1980 131 p refs
(PB81-151201) Avail: NTIS HC A07/MF A01 CSCL 17B

The potential market for satellite to home television broadcasting was examined and recommendations were made to the FCC concerning appropriate regulatory policies for direct broadcast satellites (DBS) for the period following the 1983 Regional Administrative Radio Conference (RARC). It is concluded that many substitutes for DBS will be available in the market for subscription video programming. Either conventional broadcast regulation, which assumes scarcity of channels, nor common carrier regulation, which assumes monopoly power will be appropriate. The report recommends several functions the Commission should perform because of its spectrum allocation responsibilities, but recommends that the Commission make no rules concerning compatibility, signal quality, ownership of receiving equipment, program content, prices, service offerings, or control of channels. GRA

N81-26005# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

ZERO CROSSINGS PROPERTIES OF A NARROW BAND PROCESS TO DETERMINE THE RELIABILITY OF A TWO FREQUENCY ENCODING: APPLICATION TO EVALUATING ITS AUTOCORRELATION ENVELOPE

Jacques Hay *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1980-4 (ESA-TT-672) Mar. 1981 p 57-68 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-4, Jul. - Aug. 1980 p 271-281 Original report in FRENCH previously announced as A80-52917/4 (For primary document see N81-26000 16-99)
Avail: NTIS HC A05/MF A01

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N81-25299* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PORTABLE APPLIANCE SECURITY APPARATUS Patent
James J. Kerley, inventor (to NASA) Issued 24 Feb. 1981 7 p Filed 17 Nov. 1978 Supersedes N79-13261 (17 - 04, p 0446)
(NASA-Case-GSC-12399-1; US-Patent-4,252,007; US-Patent-Appl-SN-961831; US-Patent-Class-70-58) Avail: US Patent and Trademark Office CSCL 09B

An apparatus for securing a small computer, or other portable appliance, against theft is described. It is comprised of a case having an open back through which the computer is installed or removed. Guide members in the form of slots are formed in a rear portion of opposite walls of the case for receiving a back plate to cover the opening and thereby secure the computer within the case. An opening formed in the top wall of the case exposes the keyboard and display of the computer. The back plate is locked in the closed position by a key-operated plug type lock. The lock is attached to one end of a hold down cable, the opposite end thereof being secured to a desk top or other stationary object. Thus, the lock simultaneously secures the back plate to the case and retains the case to the stationary object. Official Gazette of the U.S. Patent and Trademark Office

N81-25300 Ohio Univ., Athens.
LOOP, CUTSET, HYBRID AND STATE ANALYSES OF LINEAR MULTIPLE-LOOP FEEDBACK SYSTEMS Ph.D. Thesis
Hassan Mohamed Elsherif 1980 291 p
Avail: Univ. Microfilms Order No. 8110491

A general formulation is derived for the return difference matrix and the null return difference matrix of the multiple-loop feedback networks and their determinants in terms of either the loop impedance matrix, the cut admittance matrix, the hybrid matrix or the coefficient matrices of the state equations. The loop, cutset, hybrid and state variable methods of analysis were employed with the use of some transformation matrices which can be obtained for most of the practical multiple-loop feedback networks by inspection of their equivalent circuits, to obtain such formulation. It is shown, with the aid of some practical illustrative examples, that this formulation is useful in the analysis of multiple-loop feedback systems. Dissert. Abstr.

N81-25301 Rensselaer Polytechnic Inst., Troy, N. Y.
A MODEL FOR DC INTERRUPTION IN DIFFUSE VACUUM ARCS Ph.D. Thesis
Susan Elizabeth Childs 1980 234 p
Avail: Univ. Microfilms Order No. 8109309

Before current zero, the interelectrode plasma is modeled as an ion-neutral fluid through which the electrons are flowing. Immediately after current zero there is a short period during which the plasma resistance remains low while the direction of the electron flow is reversed. Upon reversal of the electron flow, a positive ion sheath grows into the plasma from the former anode driven by the transient recovery voltage. The decay of the interelectrode plasma during interruption is described mathematically by the one dimensional unsteady compressible flow equations, which are solved numerically using a modified method of characteristics, whereby the characteristic directions are calculated at points on a predetermined grid. Dissert. Abstr.

N81-25302 Illinois Univ. at Urbana-Champaign.
THEORETICAL AND EXPERIMENTAL STUDY OF MILLIMETER WAVE INTEGRATED CIRCUITS Ph.D. Thesis
Naresh Chandra Deo 1980 142 p
Avail: Univ. Microfilms Order No. 8108482

The development of individual dielectric-based components, both active and passive, for eventual integration into communication or radar systems is discussed. Construction details and performance characteristics of some complete systems developed in this phase are provided. The design and fabrication exhibit considerable departure from the standard metal waveguide technology. The viability and suitability of dielectric-based integration are also established. Recommendations for future developments are presented. Dissert. Abstr.

N81-25303# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
COMPUTATION OF IMPULSE CONTROL LAWS FOR A NONLINEAR STOCHASTIC OSCILLATOR
Y. Yavin and A. Venter Mar. 1980 26 p refs Sponsored in part by Control Data Corp.
(CSIR-TWISK-143) Avail: NTIS HC A03/MF A01

Impulse control theory is applied in order to improve the performance of nonlinear stochastic second order system representing a sine wave oscillation. This is done in two stages. First the equations of optimal impulse control are introduced and a closed-form solution is given to the equations on the closed exterior of a circular disk in the X1-X2 plane. Then a finite-difference scheme is suggested for solving the equations, and they are given numerically, for a number of cases on the inside of the disk. During both stages, the action set on which an impulse is applied by the system is obtained throughout the solution. A.R.H.

N81-25304*# Vanderbilt Univ., Nashville, Tenn. School of Engineering.
CONTAMINATION CONTROL IN HYBRID MICROCIRCUIT MODULES Final Report
D. L. Kinser Aug. 1979 18 p refs
(Contract NAS8-32437)
(NASA-CR-161778) Avail: NTIS HC A02/MF A01 CSCL 09C

The influence of chemical and particulate contamination upon the reliability and service life of hybrid microelectronic systems is documented. Several coating systems used include the parylene and Dow Corning silicone (DC90-711). These passivating coatings have potential for decreasing the degradation caused by particulate contaminants in hybrid systems as well as the possible deleterious effect of trapping chemical contaminants which have long term degrading influences upon the performance of the system. The reliability of a representative hybrid microcircuit is enhanced by the coating process. S.F.

N81-25305*# Johns Hopkins Univ., Baltimore, Md. Dept. of Electrical Engineering.
TRANSIENT UPSETS IN MICROPROCESSOR CONTROLLERS
Robert E. Glaser and Gerald M. Masson May 1981 38 p refs
(Grant NsG-1442)
(NASA-CR-165713) Avail: NTIS HC A03/MF A01 CSCL 09C

The modeling and analysis of transient faults in microprocessor based controllers are discussed. Such controllers typically consist of a microprocessor, read only memory storing and application program, random access memory for data storage, and input/output devices for external communications. The effects of transient faults on the performance of the controller are reviewed. An instruction level perspective of performance is taken which is the basis of a useful high level program state description of the microprocessor controller. A transition matrix is defined which determines the controller's response to transient fault arrivals. S.F.

N81-25306# University of Southeastern Massachusetts, North Dartmouth. Dept. of Electrical Engineering.
SOME EXPERIMENTAL RESULTS ON LINEAR ESTIMATION FOR IMAGE ANALYSIS
C. H. Chen, Rong-Hwang Wu, and Chihsung Yen 28 Jan. 1981 19 p refs
(Contract N00014-79-C-0494)
(AD-A094281; SMU-EE-TR-81-4) Avail: NTIS HC A02/MF A01 CSCL 12/1

Based on a constructed textured subimage, an experimental comparison is made on the three linear estimation methods for

image segmentation, namely the maximum likelihood estimation, the maximum a posteriori estimation, and the Fisher's linear discriminant. The last two methods are shown to be feasible for effective image segmentation. M.G.

N81-25307# Raytheon Co., Waltham, Mass.
LOSSLESS BROADBAND MICROWAVE SWITCHES Final Technical Report, Sep. 1978 - May 1980
James Vorhaus Jan. 1980 69 p refs
(Contract N00014-78-C-0623; NR Proj. 251-033)
(AD-A096439; S-2837; NR-251-033F) Avail: NTIS HC A04/MF A01 CSCL 09/1

The feasibility of using dual gate field effect transistors (FET) as high speed, broadband, lossless microwave switches was demonstrated. Two different dualgate FET structures which functionally operate as multipole, multithrow switches with gain were designed. Gains as high as 18 dB at 10 GHz from simple dual gate structures were measured. On-off ratios in excess of 30 dB and channel to channel isolation in excess of 25 dB in multiport structures were measured. R.C.T.

N81-25308# Wisconsin Univ., Madison.
ASSESSMENT OF RESEARCH DIRECTIONS FOR HIGH VOLTAGE DIRECT CURRENT POWER SYSTEMS Quarterly Technical Progress Report, 1 Oct. - 31 Dec. 1980
Willis F. Long Jan. 1981 4 p
(Contract DE-AC02-78ET-39185)
(DOE/ET-29185/19) Avail: NTIS HC A02/MF A01

The hardware development and systems applications are described for high voltage direct current (HVDC) power systems. Particular emphasis is given to exemplifying cost and operational advantages of integrated ac/dc power systems. Progress is reported in the development of the following: HVDC converters; computerized simulation of HVDC systems; circuit breakers; and long range planning of HVDC projects. R.C.T.

N81-25309# Hughes Research Labs., Malibu, Calif.
ADVANCED TELD/FET TECHNOLOGY Final Report, 1 Jun. 1977 - 30 Sep. 1979
Paul T. Greiling Apr. 1981 98 p
(Contract N00014-77-C-0380; RF54582001)
(AD-A098630) Avail: NTIS HC A05/MF A01 CSCL 09/5

Planar TELDs have been designed, fabricated, and tested. Computer models have been developed for designing and predicting the characteristics of TELDs as a function of device geometry, material parameters, and bias conditions. TELDs have been fabricated on ion-implanted LPE and VPE GaAs. Frequency dividers that divide the input signal by any integer from two through nine have been realized. A process technology for fabricating TELD/FET circuits was developed and test circuits fabricated incorporating this technology. Because of the relatively low doping density requirements for TELDs, material reproducibility was not sufficient to obtain repeatable results and the current loop was not satisfactory for successful operation of the circuits. GRA

N81-25310# *Hughes Research Labs., Malibu, Calif.*
ELECTRONIC PROCESSES IN InP AND RELATED COMPOUNDS Annual Report, 13 Aug. 1979 - 12 Aug. 1980
K. V. Vaidyanathan, C. L. Anderson, H. L. Dunlap, D. E. Holmes, and G. S. Kamath Feb. 1981 40 p refs
(Contract N00019-79-C-0533)
(AD-A098349) Avail: NTIS HC A03/MF A01 CSCL 20/13

The growth and characterization of high-purity epitaxial layers grown by liquid-phase-epitaxy (LPE) are described. Chemical and electrical evaluation of the layers indicates that silicon and sulfur are the dominant residual donors in LPE-grown InP layers. Techniques for controlling these dopants are discussed. The current-voltage characteristics of Schottky diodes on p-InP are analyzed. Aluminum, silver, and gold were tried as Schottky-barrier metals. The results reported here demonstrate that Al is the best choice as the Schottky metal. An automated system to measure the relative photoresponse from Schottky diodes has been assembled. Majority carrier (hole) initiated avalanche multiplication has been observed on these Schottky diodes.

Author (GRA)

N81-25311# Notre Dame Univ., Ind. Dept. of Electrical Engineering.
A COMPARISON OF FREQUENCY-DOMAIN APPROACH AND TIME-DOMAIN APPROACH: A CASE OF FAULT ANALYSIS OF ANALOG CIRCUITS
Chen-Shang Lin 23 May 1980 11 p refs
(Contract N00014-78-C-0444)
(AD-A098739; EE-802) Avail: NTIS HC A02/MF A01 CSCL 12/1

There have been considerable efforts expended in analog fault analysis. Most of them employ frequency domain approach, i.e., diagnosing faulty components from measured transfer function, while few use time domain approach to isolate faults by means of Markov parameters. Theoretically, both approaches are still under development and all seem feasible. It is the purpose of this report to compare these two approaches numerically by simulation on RC ladders. In this example, it is shown that the time domain approach is far better than the frequency domain approach. GRA

N81-25312# Washington Univ., St. Louis, Mo. Dept. of Electrical Engineering.
SEMICONDUCTOR MILLIMETER WAVELENGTH ELECTRONICS Annual Report, Sep. 1979 - Aug. 1980
Oct. 1980 250 p
(Contract N00014-79-C-0840)
(AD-A098578; Rept-80-1-ONR) Avail: NTIS HC A11/MF A01 CSCL 20/12

This report describes progress and results obtained in the first year of the subject research program. The purpose of the program is to investigate new and innovative approaches to the generation and amplification and detection of electromagnetic signals in the milimeter wave spectrum. It incorporates theoretical and applied studies in four areas: Semiconductor material synthesis and growth; Electrical characterization of these materials; Device modeling and fabrication, and new device concepts. It is our desire to understand more fully the origin and consequences of the physical limitations of semiconductor materials appropriate for use at millimetric wavelengths, and through this knowledge to suggest new materials and/or devices with improved properties. During the period 1 September 1979 to 30 August 1980, we have initiated the growth of heavily doped GaAs, developed an apparatus for the measurement of high field transport properties, examined some impurity effects in GaAs, and laid the theoretical groundwork for a systematic study of inertial effects in semiconductor charge transport, including the concept of Zener oscillations. We have also carried out Gunn oscillator experiments that have yielded power levels of 5-6mWat frequencies near 150 GHz. A new millimeter wave mixer diode configuration is also explored. Progress is summarized in this introductory section. Detailed discussions are presented in the body of the report. GRA

N81-25313# Hydro-Electric Power Commission, Toronto *(Ontario).*
DETERMINATION OF SYNCHRONOUS-MACHINE-STABILITY STUDY CONSTANTS, VOLUME 2 Final Report
M. E. Coultes, P. L. Dandeno, P. Kundur, A. T. Porey, W. Watson, and H. M. ZeinEl-Din Dec. 1980 508 p refs Sponsored by *Electric Power Research Inst.*
(EPRI Proj. 997-2)
(EPRI-EL-1424-Vol-2) Avail: NTIS HC A22/MF A01

Data for two different 500 MW turbogenerators were determined. Results were gathered from standstill, on-line, and rated speed open circuit frequency response, dc inductance, 60 Hz field impedance, and line switching tests. The relative merits of generator models computed from standstill and on line frequency response tests, stator decrement tests and sudden short circuit tests were judged by their ability to reproduce the measured line switching transient. An equivalent circuit model with three rotor windings in each axis and d-axis rotor circuit mutual leakage elements is recommended, the parameters of the model is obtained from standstill, and in some cases also on line frequency response measurements. Magnetic nonlinearity of the iron was significant in all parts of the work. The Q-axis saturation could not be estimated adequately from d-axis characteristics. DOE

N81-25314# Sandia Labs., Albuquerque, N. Mex. Thermomechanical and Physical Div.

DYNAMICS OF VAPORIZATION AND DISSOCIATION DURING TRANSIENT SURFACE HEATING, WITH APPLICATION TO VACUUM ARCS

David A. Benson Feb. 1981 49 p refs
(Contract DE-AC04-76DP-00789)
(SAND-81-0116) Avail: NTIS HC A04/MF A01

A model of vaporization and dissociation occurring as a result of intense heating over a localized area of a material surface is described. The balance of heat between the input power and losses due to vaporization, as well as radiation and conduction in the material, are considered. The model includes the effect of binary mass diffusion and changes of surface stoichiometry for multiple component materials. Effects of vapor recondensation are also included. The model is applied to the description of spot heating on a vacuum arc anode through the use of a simple power feedback model. Comparison of surface temperature measurements to model predictions are used to parametrically describe the arc behavior. Extensive parametric analyses showing the effect of material property variations on the arc behavior are described. DOE

N81-25315# Naval Research Lab., Washington, D. C.

MIXED SLOW WAVE OPERATION OF A WIDE BAND DIELECTRIC GYROTRON Interim Report

J. Choe, H. Uhm, and S. Ahn 7 May 1981 29 p refs
(AD-A098624; NRL-MR-4510) Avail: NTIS HC A03/MF 01 CSCL 09/5

The bandwidth broadening effect of mixing two slow wave modes in a dielectric loaded gyrotron is investigated for a small axial momentum spread. The usual intermediate wavelength model (IWM) combines with the short wavelength mode (SWM) by reducing the electron beam radius and creates a mixed slow wave. The resulting bandwidth for the mixed mode gyrotron becomes at least twice broader than that for the pure IWM at the small velocity spread (about but less than 1%) with a substantial contribution of the SWM. Moreover, the mixed mode operation can allow up to several times more power than the usual IWM mode operation. Author (GRA)

N81-25316# Market Facts, Inc., Washington, D. C.

ENERGY-EFFICIENT ELECTRIC MOTORS STUDY

23 Mar. 1981 144 p
(Contract DE-AC01-79CS-40265)
(DOE/CS-40265/T1) Avail: NTIS HC A07/MF A01

A survey conducted of purchasers of integral horsepower polyphase motors measured current knowledge of and awareness of energy efficient motors, decision making criteria, information sources, purchase and usage patterns, and related factors. The data obtained were used for the electric motor market penetration analysis. Additionally, a telephone survey was made. The study also provides analyses of distribution channels, commercialization constraints, and the impacts of government programs and rising energy prices. Study findings, conclusions, and recommendations are presented. Sample questionnaires and copies of letters to respondents are presented in appendices as well as descriptions of the methods used. DOE

N81-25317# Environmental Protection Agency, Ann Arbor, Mich. Test and Evaluation Branch.

SEVERAL AMBIENT CARBON MONOXIDE STUDIES Summary Report

Mark Wolcott Nov. 1980 24 p refs
(PB81-153561; EPA-AA-TEB-81-9) Avail: NTIS HC A02/MF A01 CSCL 13F

The Federal Clean Air Act monoxide (CO) is reviewed. Standards of 25 parts per million (ppm) maximum allowable one hour expected concentration level and 9 ppm maximum allowable expected eight hour average concentration level are proposed. In an effort to achieve these standards the Clean Air Act also promulgates regulations regarding the amount of CO new highway vehicles may emit from the tailpipe. Recent CO emission inventory estimates, the meteorological conditions associated with high ambient CO concentrations, the distribution of CO concentrations within selected cities, the effects on CO concentration levels of both meteorological conditions and traffic characteristics at typical hot spot locations and the estimated amount that in use vehicle emissions must be reduced are included. GRA

N81-25318# Patent and Trademark Office, Washington, D. C. Office of Technology Assessment and Forecast.

PATENT PROFILES: MICROELECTRONICS, 1

Feb. 1981 262 p
(PB81-179582) Avail: NTIS HC A12/MF A01 CSCL 09E

Activity in those portions of the patent file that relate to the specific structure of integrated circuits and to systems in which the inventive thrust involves the use of a microelectronic information processing device such as a central processing unit is reported. For each area, the activity over a 10 year span is graphically illustrated and tables show the data relied upon for the illustrations. Assignees are listed by the number of patents held as well as alphabetically and numerically by the title of the patent. Inventors of unassigned patents from 1975 to 1979 are listed as well as their addresses. An updating technique to 1980 is also provided. A.R.H.

N81-25319# National Bureau of Standards, Boulder, Colo. Thermophysical Properties Div.

HELIUM RESEARCH IN SUPPORT OF SUPERCONDUCTING POWER TRANSMISSION Annual Report, 1 Oct. 1978 - 30 Sep. 1979

D. E. Daney, ed. Dec. 1980 59 p refs Sponsored by DOE Prepared for Brookhaven National Lab.
(PB81-156606; NBSIR-80-1637) Avail: NTIS HC A04/MF A01 CSCL 09C

The development of a fundamental understanding of the counter flow method of the superconducting power transmission line (SPTL) cool down is reported. It is emphasized that the analytical, numerical, and experiments results accurately model the cool down of full scale SPTL's. The cable permeability measurements indicate that any significant rupture of the lead gas barrier of the cable will lead to an unacceptable high leak rate from the pressurized core. E.A.K.

N81-25320*# National Bureau of Standards, Washington, D.C. National Engineering Lab.

SEMICONDUCTOR TECHNOLOGY PROGRAM. PROGRESS BRIEFS Interim Report, Jul. - Sep. 1979

W. Murray Bullis, ed. Dec. 1979 16 p refs Sponsored by NASA, DARPA, DOE, DNA, Charles Stark Draper Lab., Army Electronics Research and Development Command, AFAL, Naval Material Command, NWSC, Solar Energy Research Inst., Naval Avionics Center, and ONR
(NASA-CR-164401; PB81-154122; NBSIR-79-1591-5) Avail: NTIS HC A02/MF A01 CSCL 14B

The current status of NBS work on measurement technology for semiconductor materials, process control, and devices is reported. Results of both in-house and contract research are covered. Highlighted activities include modeling of diffusion processes, analysis of model spreading resistance data, and studies of resonance ionization spectroscopy, resistivity-dopant density relationships in p-type silicon, deep level measurements, photoresist sensitometry, random fault measurements, power MOSFET thermal characteristics, power transistor switching characteristics, and gross leak testing. New and selected on-going projects are described. Compilations of recent publications and publications in press are included. GRA

N81-25321# National Bureau of Standards, Washington, D.C. National Engineering Lab.

SEMICONDUCTOR TECHNOLOGY PROGRAM. PROGRESS BRIEFS Interim Report, Apr. - Jun. 1979

W. Murray Bullis, ed. Aug. 1979 12 p refs Sponsored by DARPA, NBS, DOE, DNA, Charles Stark Draper Lab., Army Electronics Research and Development Command, AFAL, Naval Material Command, NWSC, Solar Energy Research Inst., and Naval Avionics Center 2 Vol.
(PB81-154114; NBSIR-79-1591-4) Avail: NTIS HC A02/MF A01 CSCL 14B

Measurement technology is assessed for semiconductor materials, process control, and devices. Activities include: laser annealing of silicon; dopant density profiles; silicon dioxide film thickness standards; intrachip linewidth variation; photoresist sensitometry; optical linewidth measurements; optical imagery

calculations; and moisture measurement by mass spectroscopy.
GRA

N81-25322*# National Bureau of Standards, Washington, D.C. National Engineering Lab.
SEMICONDUCTOR TECHNOLOGY PROGRAM. PROGRESS BRIEFS Interim Report, Apr. - Jun. 1980
W. Murray Bullis Oct. 1980 13 p refs Sponsored by NASA DARPA, NBS, DOE, DNA, Charles Stark Draper Lab., Naval Air Systems Command, AFWAL, Army Electronics Technology and Devices Labs., NWSC, Solar Energy Research Inst., Naval Avaionics Center, ONR, and NOSC 2 Vol.
(NASA-CR-164383; PB81-154106; NBSIR-80-2006-3) Avail: NTIS HC A02/MF A01 CSCL 14B

Measurement technology for semiconductor materials, process control, and devices is reviewed. Activities include: optical linewidth and thermal resistance measurements; device modeling; dopant density profiles; resonance ionization spectroscopy; and deep level measurements. Standardized oxide charge terminology is also described. GRA

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also 02 Aerodynamics and 77 Thermodynamics and Statistical Physics.

N81-25323 Stanford Univ., Calif.
***FINITE ELEMENT SIMULATION OF TURBULENT STRATIFIED FLOWS* Ph.D. Thesis**
Angelos Nicolaos Findikakis 1981 294 p
Avail: Univ. Microfilms Order No. 8108923

A Sub-Grid-Scale (SGS) model is developed for representing the effect of the small-scale turbulent motions that are not resolved explicity. Differential equations for the SGS Reynolds stresses and turbulent heat fluxes are presented and then reduced to a system of algebraic equations by introduction of closure approximations and simplifying assumptions. The solution of the system of the algebraic equations for the SGS second order moments is cast in an eddy viscosity-eddy diffusivity form, the eddy coefficients being functions of the local structure of the velocity and temperature fields, and a SGS turbulence length scale. A simpler version of the algebraic SGS turbulence model is derived by assuming that the isotropic terms in the algebraic equations for the SGS moments are dominant. Dissert. Abstr.

N81-25324 State Univ. of New York, Stony Brook.
MICROSCOPIC THEORY OF TRANSPORT IN DILUTE SUSPENSIONS AND SOLUTIONS *Ph.D. Thesis*
Wokyung Sung 1980 196 p
Avail: Univ. Microfilms Order No. 8109041

A simple method for calculating the transport coefficients for binary hard-sphere mixtures with one trace component of extreme mass disparity (Lorentzian and Rayleighian mixtures) is developed. The results are exact on the Enskog theory level, within the framework of the Chapman-Enskog solution. A comparative analysis of shear viscosity, bulk viscosity and thermal conductivity in the Lorentz and Rayleigh limits is included. A microscopic theory of intrinsic shear and bulk viscosities is given for a model of particles that interact with hard-sphere cores and weak long-range attraction. A theory of transport is developed for dilute suspensions and solutions in which the dynamics of the solute-solvent (i.e., tagged particle-fluid particle) collareion are treated on a level of the Enskog approximation, appropriately modified by the presence of the solvent sea, which is described hydrodynamically. The intrinsic shear and bulk viscosities of a hard-sphere solute in a hard-sphere solvent are calculated by using the idea, of an effective collision radius of the solute-solvent collision. Dissert. Abstr.

N81-25325 Case Western Reserve Univ., Cleveland, Ohio.
HEAT AND MASS TRANSFER CHARACTERISTICS OF TRANSPIRATION COOLING Ph.D. Thesis
Kishore Kumar Kar 1981 346 p
Avail: Univ. Microfilms Order No. 8109593

Correlation equations are found which relate friction factor with Reynolds number and Nusselt number with Reynolds number (or Peclet number) for isothermal and nonisothermal flow through porous materials. The flow and heat transfer characteristics of the scaled-up models and the sintered porous materials were investigated in the laboratory under the countercurrent heat and mass transfer boundary conditions simulating the transpiration cooling phenomenon. It is found that for transpiration cooling purpose, Darcian flow through sintered material suffices to achieve required cooling. Furthermore, it is recognized that the effective thermal conductivity as well as the internal heat transfer coefficient of the porous medium play an important role in determining the wall temperature and the wall thickness.
Dissert. Abstr.

N81-25326 Stanford Univ., Calif.
SYMMETRIC AND ASYMMETRIC UNBOUNDED LIQUID BRIDGES Ph.D. Thesis
Thomas Irvin Vogel 1981 123 p
Avail: Univ. Microfilms Order No. 8109010

Let E be an energy functional acting on sets, involving the perimeter of the set and a nonnegative potential energy term which is locally integrable. A set A minimizes E with obstacle Q if A has the smallest energy over the family of sets containing Q. Given any (possibly unbounded) Caccioppoli set Q (i.e., locally finite perimeter) there is a set which minimizes the energy functional over compact perturbations with obstacle Q. A special case of the preceding results, the unbounded liquid bridge problem, is analyzed. In the symmetric case in three dimensions, results concerning the family of profile curves are obtained, notably that the curve determined by the vertical points of the profiles is continuously differentiable. Dissert. Abstr.

N81-25327# Academy of Sciences (USSR), Moscow. Space Research Inst.
STABILITY, NON-UNIQUENESS AND TRANSITION TO TURBULENCE IN THE FLOW BETWEEN TWO ROTATING SPHERES
I. M. Yavorskaya, Yu. N. Belyaev, A. A. Monakhov, N. M. Astafeva, S. A. Scherbakov, and N. D. Vvdenskaya 1980 65 p refs
(Rept-595) Copyright. Avail: Issuing Activity

Experimental and numerical stability analyses of viscous incompressible fluid flow between two concentric coaxially rotating spheres are presented for a wide range of similarity parameters. The stability curves for different gap sizes are found. The non-uniqueness of the secondary flows for the same supercritical values of the parameters are shown both experimentally and numerically. The regions of the existence of different regimes in the space of similarity parameters are found. The transition to turbulence in wide gap case is investigated by spectral and correlation analyses of radial velocity fluctuations. S.F.

N81-25328# RAND Corp., Santa Monica, Calif.
THE H-R SUBx METHOD FOR PREDICTING TRANSITION
A. R. Wazzan, C. Gazley, Jr., and A. M. O. Smith (California Univ., Los Angeles) Jan. 1981 14 p refs
(RAND/P-6581) Avail: NTIS HC A02/MF A01

A shortcut method, the H-R sub x method, for predicting transition in a wide class of boundary layer flows, including the effects of pressure gradient, surface heat transfer, and suction is described. Here H and R sub x are the body shape factor and the Reynolds number, based on distance x measured in the direction of the flow, respectively. The method is extremely simple to use and a good substitute to the well known but rather complicated to the 9th power method. Author

N81-25329# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
LOCAL ENERGY DECAY OF SOLUTIONS OF LINEARIZED SHALLOW WATER EQUATIONS
Tunc Gȕveci and Barbara Kok May 1980 19 p refs
(CSIR-TWISK-155) Avail: NTIS HC A02/MF A01

The local decay of the energy of the solution to a mixed initial boundary value problem is proved for the linearized shallow water equations with constant coefficients, where the domain is a half plane, a certain dissipative boundary condition is prescribed

and the initial data have compact support contained in the open half plane. Author

N81-25330# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).

COMPARISON BETWEEN A VARIATIONAL TECHNIQUE AND A MODIFIED BAYLISS-ISAACSON METHOD FOR ENFORCING CONSERVATION OF POTENTIAL ENTROPHY IN SHALLOW-WATER EQUATIONS MODELS

I. M. Navon Jul. 1980 43 p refs

(CSIR-TWISK-166) Avail: NTIS HC A03/MF A01

A Sasaki variational approach is for the first time applied to enforce conservation of potential enstrophy and total mass in long term integrations of two ADI finite-difference approximations of the nonlinear shallow-water equations on a beta plane. The performance of the variational approach is compared with that of a modified Bayliss-Isaacson technique also designed to enforce conservation of potential enstrophy and total mass at each time step of the numerical integration. Both techniques yielded very satisfactory results after 20 days of numerical integration. It appears, however, that the Bayliss-Isaacson technique is more robust and less demanding of CPU time, while the modified Sasaki variational technique is highly dependent on the method used to update the Lagrange multiplier. T.M.

N81-25331# Council for Scientific and Industrial Research, Pretoria (South Africa).

FORCED CONVECTIVE HEAT TRANSFER IN SINGLE PHASE FLOW OF A NEWTONIAN FLUID IN A CIRCULAR PIPE, AN ANNOTATED SUMMARY OF EMPIRICAL CORRELATIONS

D. G. Rogers Apr. 1980 166 p refs

(CSIR-CENG-322; ISBN-0-7988-1921-9) Avail: NTIS HC A08/MF A01

Empirical correlations for the Nusselt group for internal Newtonian pipe flow are presented to facilitate the design of heat transfer equipment. An index is provided for locating experimental heat transfer coefficients for particular fluids and flow conditions. A.R.H.

N81-25332# Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.

ANALYSIS OF SWIRLING JET TURBULENT MIXING AND COMBUSTION

J. P. Sislian Mar. 1981 60 p refs Sponsored by the Natural Sciences and Engineering Research Council of Canada

(UTIAS-249; CN-ISSN-0082-5255) Avail: NTIS HC A04/MF A01

Flows generated by swirling jet turbulent mixing and combustion are investigated. The full Navier-Stokes equations for momentum and energy conservation, as well as for global continuity and species continuity are derived for the mean mass averaged variables of a compressible, turbulent, nonswirling or swirling plane, or axisymmetric flow in orthogonal curvilinear body-oriented system of coordinates, which contain, in general, the six components of the Reynolds (turbulent) stress tensor. A simplified combustion model is assumed, represented by a one-step rate process between just two species, fuel and oxidant. In order to test the validity and reliability of the derived model equations in the simpler case of turbulent weakly swirling and combusting flows, a complete set of second-order boundary layer (parabolic) equations is derived. It is believed that the numerical solution of the equations provides insight into the mechanism of swirling jet turbulent mixing and combustion. J.M.S.

N81-25333*# Purdue Univ., Lafayette, Ind. Thermal Sciences and Propulsion Center.

STAGNATION REGION GAS FILM COOLING: SPANWISE ANGLED INJECTION FROM MULTIPLE ROWS OF HOLES Final Report

D. W. Luckey and M. R. Lecuyer Apr. 1981 81 p refs

(Grant NsG-3071; Contract N00014-75-C-0873)

(NASA-CR-165333) Avail: NTIS HC A05/MF A01 CSCL 20D

The stagnation region of a cylinder in a cross flow was used in experiments conducted with both a single row and multiple rows of spanwise angled (25 deg) coolant holes for a range of the coolant blowing ratio with a freestream to wall temperature ratio approximately equal to 1.7 and R(eD) = 90,000. Data from local heat flux measurements are presented for injection from a single row located at 5 deg, 22.9 deg, 40.8 deg, 58.7 deg from stagnation using a hole spacing ratio of S/d(o) = 5 and 10. Three multiple row configurations were also investigated. Data are presented for a uniform blowing distribution and for a nonuniform blowing distribution simulating a plenum supply. The data for local Stanton Number reduction demonstrated a lack of lateral spreading by the coolant jets. Heat flux levels larger than those without film cooling were observed directly behind the coolant holes as the blowing ratio exceeded a particular value. The data were spanwise averaged to illustrate the influence of injection location, blowing ratio and hole spacing. The large values of blowing ratio for the blowing distribution simulating a plenum supply resulted in heat flux levels behind the holes in excess of the values without film cooling. An increase in freestream turbulence intensity from 4.4 to 9.5 percent had a negligible effect on the film cooling performance. A.R.H.

N81-25334*# Old Dominion Univ., Norfolk, Va. Dept. of Mathematical Sciences.

A MODIFIED DODGE ALGORITHM FOR THE PARABOLIZED NAVIER-STOKES EQUATIONS AND COMPRESSIBLE DUCT FLOWS Progress Report, 1 Dec. 1980 - 31 May 1981

C. H. Cooke Jun. 1981 22 p refs

(Grant NsG-1517)

(NASA-CR-164435) Avail: NTIS HC A02/MF A01 CSCL 20D

A revised version of a split-velocity method for numerical calculation of compressible duct flow was developed. The revision incorporates balancing of mass flow rates on each marching step in order to maintain front-to-back continuity during the calculation. The (checkerboard) zebra algorithm is applied to solution of the three-dimensional continuity equation in conservative form. A second-order A-stable linear multistep method is employed in effecting a marching solution of the parabolized momentum equations. A checkerboard successive overrelaxation iteration is used to solve the resulting implicit nonlinear systems of finite-difference equations which govern stepwise transition. S.F.

N81-25335*# Old Dominion Univ., Norfolk, Va. Research Foundation.

INFLUENCE OF NONEQUILIBRIUM RADIATION AND SHAPE CHANGE ON AEROTHERMAL ENVIRONMENT OF A JOVIAN ENTRY BODY Progress Report, 1 Aug. 1979 - 29 Feb. 1980

S. N. Tiwari and S. V. Subramanian May 1981 172 p refs

(Grant NsG-1500)

(NASA-CR-3432) Avail: NTIS HC A08/MF A01 CSCL 20D

The influence of nonequilibrium radiative energy transfer and the effect of probe configuration changes on the flow phenomena around a Jovian entry body are investigated. The radiating shock layer flow is assumed to be axisymmetric, viscous, laminar and in chemical equilibrium. The radiative transfer equations are derived under nonequilibrium conditions which include multilevel energy transitions. The equilibrium radiative transfer analysis is performed with an existing nongray radiation model which accounts for molecular band, atomic line, and continuum transitions. The nonequilibrium results are obtained with and without ablation injection in the shock layer. The nonequilibrium results are found to be greatly influenced by the temperature distribution in the shock layer. In the absence of ablative products, the convective and radiative heating to the entry body are reduced under nonequilibrium conditions. The influence of nonequilibrium is found to be greater at higher entry altitudes. With coupled ablation and carbon phenolic injection, 16 chemical species are used in the ablation layer for radiation absorption. Equilibrium and nonequilibrium results are compared under peak heating conditions. S.F.

N81-25336*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

INTEGRATED TRANSIENT THERMAL-STRUCTURAL FINITE ELEMENT ANALYSIS

Earl A. Thornton (Old Dominion Univ.), Pramote Dechaumphai (Old Dominion Univ.), Allan R. Wieting, and Kumar K. Tamma (Old Dominion Univ.) May 1981 19 p refs Presented at the

AIAA Struct. Dyn. Spec. Meeting, Atlanta, 9-10 Apr. 1981
(NASA-TM-83125) Avail: NTIS HC A02/MF A01 CSCL 12A

An integrated thermal structural finite element approach for efficient coupling of transient thermal and structural analysis is presented. Integrated thermal structural rod and one dimensional axisymmetric elements considering conduction and convection are developed and used in transient thermal structural applications. The improved accuracy of the integrated approach is illustrated by comparisons with exact transient heat conduction elasticity solutions and conventional finite element thermal finite element structural analyses. S.F.

N81-25337# Oregon State Univ., Corvallis. Dept. of Atmospheric Sciences.
***DEPENDENCE OF MIXED-LAYER ENTRAINMENT ON* SHEAR STRESS AND VELOCITY JUMP Final Report, 1 May 1979 - 30 Apr. 1981**
J. W. Deardorff and G. E. Willis 30 Apr. 1981 56 p refs
(Contract N00014-79-C-0440; NR Proj. 062-640)
(AD-A098237) Avail: NTIS HC A04/MF A01 CSCL 20/4

From new rotating-screen annulus experiments, the mixed-layer growth rate is found to depend on both the surface friction velocity and the interfacial velocity jump in a multiplicative sense, with the velocity-jump dependence being the stronger. The dimensionless velocity-jump parameter, Rv, can vary substantially during entrainment. The effect of sidewall friction, if not too strong, is to decrease the entrainment rate through its increase of Rv. Author (GRA)

N81-25338# *Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.*
VAHM: A VERTICALLY AVERAGED HYDRODYNAMIC MODEL USING BOUNDARY-FITTED COORDINATES Final Report
Billy H. Johnson Sep. 1980 115 p refs
(DA Proj. 4A0-61101-A-91D)
(AD-A094247; WES/MP/HL-80-3) Avail: NTIS
HC A06/MF A01 CSCL 20/4

A numerical model called the vertically averaged hydrodynamic model for computing the vertically averaged hydrodynamics of a water body, including salinity effects, was developed. The model employs the concept of boundary-fitted coordinates to allow for an accurate representation of the boundary of the region being modeled while retaining the simplicity of the finite difference method of solution. Although a general curvilinear coordinate system covers the physical domain, all computations to solve the governing fluid dynamic equations, as well as the computation of the boundary fitted coordinate system, are performed in a transformed rectangular plane with square grid spacing. A combination implicit-explicit finite difference scheme are employed to numerically solve the governing equations. With such a scheme, the water surface elevation is computed implicity using the Accelerated Gauss-Seidel solution technique, whereas the velocity and salinity fields are solved in an explicit manner. The major advantage of such a scheme is that the speed of a surface gravity wave is removed from the stability criteria while many desirable features of an explicit scheme are retained. R.C.T.

N81-25339# Florida State Univ., Tallahassee. Dept. of Oceanography.
LARGE SCALE FLOW GENERATION IN TURBULENT CONVECTION
Ruby Krishnamuri and Louis N. Howard (MIT) Dec. 1980 28 p refs Submitted for publication
(Contract N00014-75-C-0877; NR Proj. 062-547)
(AD-A096453; TR-18) Avail: NTIS HC A03/MF A01 CSCL 20/4

The conditions for occurrence and determination of the direction of large scale circulation are described. In a horizontal layer of fluid heated below and cooled above, cellular convection with horizontal length scale comparable to the layer depth occurs for small enough values of the Rayleigh number. As the Rayleigh number is increased, cellular flow disappears and is replaced by a random array of transient plumes. Upon further increase, these plumes drift in one direction near the bottom, in the opposite direction near the top of the layer with the axes of plumes tilted in such a way that horizontal momentum is transported upwards via the Reynolds stress. With the onset of this large scale flow, the largest scale of motion increases from that comparable to the layer depth to a scale comparable to the layer width. E.A.K.

N81-25340# Naval Postgraduate School, Monterey, Calif.
CONTROL OF AIRFLOW ABOUT A HIGH ENERGY LASER TURRET M.S. Thesis
Alan Michael Mandigo Dec. 1980 72 p refs
(AD-A098568; NPS-80-019) Avail: NTIS HC A04/MF A01 CSCL 20/4

A high energy laser system inflicts damage on a target by radiating large amounts of thermal energy onto a small area. Airflow about the laser turret, which is located on top of the aircraft fuselage, is unsteady and causes problems in beam control. The problems are jitter, which is vibration of the laser beam, and optical path distortions. The theory of flow around a cylinder and around a sphere was examined, and several airflow control techniques were screened in an effort to suppress the unsteadiness of the flow. A fairing and turret base suction apparatus was selected and experimentally tested in a wind tunnel. During the course of the experiments several parameters were varied as follows: blower flow rate, spacing between turret and fairing nosepiece, and flow rate in five separate ducts. Results of the tests indicate that the fairing and base suction technique eliminates the unsteadiness. Further research and testing are required to develop this technique for actual use on aircraft. Author (GRA)

N81-25341# New Jersey Inst. of Tech., Newark
INVESTIGATION OF THE PARTICLE PARAMETERS *ASSOCIATED WITH FLUIDIC CONTAMINATION* Final Report, 1 Nov. 1976 - 28 Feb. 1981
R. Y. Chen and W. C. Chen Apr. 1981 20 p refs
(Contract DAAG29-80-C-0090; Grant DAAG29-77-G-0012)
(AD-A098638; ARO-13614.4-E) Avail: NTIS
HC A02/MF A01 CSCL 20/4

A numerical analysis of the mechanics of deposition in horizontal and vertical conduits of constant, converging, and diverging cross-sectional area under the combined influences of diffusion, electrostatic charge, gravitation, and inertial forces has been made. The analysis also identified the conditions under which some of these forces may be neglected. Experiments and theoretical analysis showed that electrostatic charge effect is the major cause of deposition. The other significant forces affecting the deposition are gravity, surface adhesive force, diverging angle of the conduit, particle inertia and the diffusive force of the particle. Author (GRA)

N81-25342# California Univ., Irvine.
NUMERICAL PREDICTION OF WAVE FORCES ON SUBMERGED HALF-CYLINDERS
C. A. Brebbia Oct. 1980 29 p refs
(Contract N00014-80-C-0125)
(AD-A098564) Avail: NTIS HC A03/MF A01 CSCL 12/1

The present report investigates different numerical methods of solution to compute wave forces on submerged shell type structures of arbitrary shape. Although we only dealt here with two dimensional applications, future applications will involve three dimensional analysis. Hence it is of primary importance that the technique under consideration can be extended to three dimensional applications. The report considers for comparison purpose the application of the finite element method but it is evident that the technique can not be easily extended to general three dimensional problems. Thus we concentrate on the boundary element method which is newly developed technique. The present report deals with the accurate computation of the forces on the semimerged shells and concludes that it is necessary to properly define the geometry of the obstruction. Otherwise an uneconomic number of fluid boundary elements is required to obtain accurate solutions. Higher order elements as the one advocated in this report are also necessary to maintain compatibility of shell and fluid movements. GRA

N81-25343# Coastal Engineering Research Center, Fort Belvoir, Va.
ESTIMATION OF WAVE TRANSMISSION COEFFICIENTS FOR OVERTOPPING OF IMPERMEABLE BREAKWATERS Coastal Engineering Technical Aid Report

William N. Seelig Dec. 1980 14 p refs
(AD-A098388; CERC-CETA-80-7) Avail: NTIS HC A02/MF A01 CSCL 20/4

Methods are presented for estimating coefficients of wave transmission by overtopping for smooth and rough impermeable breakwaters. These techniques can be used for monochromatic or irregular wave conditions and for submerged breakwaters. Example problems are worked to illustrate calculations.

Author (GRA)

N81-25344# Naval Ship Research and Development Center, Bethesda, Md.

THE INFLUENCE OF HYDROFOIL OSCILLATION ON BOUNDARY LAYER TRANSITION AND CAVITATION NOISE

Young T. Shen and Frank B. Peterson Apr. 1981 33 p refs
(SR0230101)
(AD-A098550; DTNSRDC-81/035) Avail: NTIS HC A03/MF A01 CSCL 20/4

Effects of boundary layer characteristics on cavitation and the effect of unsteady cavitation on noise were studied. Three pinhole-type pressure transducers were installed on the foil surface to measure pressure fluctuations and a hydrophone was used to measure the radiated cavitation noise. Two subjects are discussed: relationship of boundary layer transition and pressure fluctuations with the hydrofoil in oscillation, and noise generated by unsteady cavitation. The magnitudes of pressure fluctuations in transition and turbulent regions are independent of oscillation amplitude and frequency. However, the development of boundary layer and occurrence of transition are delayed with an increase in oscillation frequency. The influence of hydrofoil oscillation on cavitation inception is also discussed. Author

N81-25345# Yale Univ., New Haven, Conn. Dept. of Computer Science.

NUMERICAL COMPUTATION OF LARGE AMPLITUDE INTERNAL SOLITARY WAVES

Tony F. C. Chan 20 Mar. 1981 43 p refs Sponsored in cooperation with Dynamics Technology, Inc. and Florida State Univ.
(Contract N00014-80-C-0076)
(AD-A098719; Rept-198) Avail: NTIS HC A03/MF A01 CSCL 20/4

Finite amplitude internal solitary waves in a stratified fluid are computed numerically as solutions to a version of Long's equation. Newton's method is used to linearize the two dimensional nonlinear elliptic equation and numerical continuation techniques, both using the wave speed and a pseudo-arclength parameter, are used to trace out solution branches efficiently. Numerical results for the 'tanh' density profile are presented for various depths of the fluid. For shallow depths, solutions for a fixed wave speed are not unique and bore-like solutions with large amplitude have been found. In the deep water case, excellent agreement is obtained with the experimental data of Davis and Acrivos whereas traditional weakly nonlinear analysis fails to produce agreement in the large amplitude regime. GRA

N81-25346# Argonne National Lab., Ill. Engineering Div.

PARTICULATE DEPOSITION FROM TURBULENT PARALLEL STREAMS

Kwan H. Im and Paul M. Chung Feb. 1981 25 p refs
(Contract W-31-109-eng-38)
(ANL/MHD-81-2) Avail: NTIS HC A02/MF A01

A theory is developed for particulate deposition rate on surfaces from turbulent gas streams. The three characteristic times, controlling the deposition mode are considered: particle equilibrium time, turbulent fluctuation time, and the particle residence time. The larger particles reach the wall across the laminar sublayer because of the momentum imparted to them by the turbulence velocity of the fluid. The smaller particles, on the other hand, diffuse to the wall by thermophoresis which depends on the temperature gradient. The computed results of the theory for pipe flow are compared with the available experimental data and satisfactory agreement is shown. DOE

N81-25347# California Univ., Irvine. Dept. of Mechanical Engineering.

EFFECT OF SOLID PARTICLES ON THE TURBULENT FLOW OF A ROUND GASEOUS JET: A MATHEMATICAL AND EXPERIMENTAL STUDY Quarterly Technical Progress Report, 1 Oct. - 31 Dec. 1980

S. Elghobashi Feb. 1981 27 p refs
(Contract DE-FG22-80PC-30303)
(DOE/PC-30303/T1) Avail: NTIS HC A03/MF A01

Turbulent two-phase flow which occurs during the combustion of pulverized coal was studied. The mathematical study includes derivation of the complete time-averaged conservation equations of the two phase turbulent flow. The conservation equations are of: (1) continuity of the solid phase; (2) momentum of the solid phase in the axial and radial directions; (3) momentum of the gaseous phase in the axial and radial directions; (4) turbulence kinetic energy; and (5) dissipation rate of the turbulence kinetic energy. The design of the experimental apparatus, hardware fabrication, and the beginning of equipment assembly were also studied. Author (DOE)

N81-25348# General Electric Co., San Jose, Calif. Nuclear Energy Engineering Div.

MEASUREMENTS OF WALL-PRESSURE FLUCTUATIONS ON A CYLINDER IN ANNULAR WATER FLOW WITH UPSTREAM DISTURBANCES. PART 1: NO FLOW SPOILERS

T. M. Mulcahy, M. W. Wambsganss, W. H. Lin, T. T. Yeh, and W. P. Lawrence Jan. 1981 124 p refs
(Contract DE-AC02-77ET-34209)
(GEAP-24310; ANL-CT-81-11; DOE/N/4175-15) Avail: NTIS HC A06/MF A01

Data for surface pressures on a finite length rod in an annular region are presented as a function of distance along the rod and compared with existing data for well developed flow. Normalizations of the power spectral densities for different flow rates and three hydraulic diameters are considered, and the possible spurious effects of flow noise, entrance conditions, and transducer size effects are discussed. Surface pressure power spectral density levels are identified. DOE

N81-26002# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

NUMERICAL SIMULATION OF A THREE DIMENSIONAL WALL SEPARATION

Germain Billet *In its* La Rech. Aerospatiale, Bi-Monthly Bull. No. 1980-4 (ESA-TT-672) Mar. 1981 p 11-23 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-4, Jul. - Aug. 1980 p 229-240 Original report in FRENCH previously announced as A80-52914/4 (For primary document see N81-26000 16-99)
Avail: NTIS HC A05/MF A01

N81-26011# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

TRANSITION AND SEPARATION: VISUALIZATIONS IN THE ONERA WATER TUNNEL

Henri Werle *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-5 (ESA-TT-673) Mar. 1981 p 35-49 refs Transl. into ENGLISH of La Rech. Aerospastiale, Bull. Bimestriel (Paris), no. 1980-5, Sep. - Oct. 1980 p 331-345 (For primary document see N81-26008 16-99)
Avail: NTIS HC A05/MF A01

N81-26016# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

SOLUTION OF THE NAVIER-STOKES EQUATIONS BY A METHOD OF HIGH ACCURACY IN SPACE AND TIME

Ph. Roy *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-6 (ESA-TT-687) Dec. 1980 p 3-15 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull Bimestriel (Paris), no. 1980-6, Nov. - Dec. 1980 p 373-385 Original report in FRENCH previously announced as A81-19551 (For primary document see N81-26015 16-99)
Avail: NTIS HC A05/MF A01

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N81-25349 Texas Univ. at Arlington.
THE DEVELOPMENT AND APPLICATION OF A PHOTOACOUSTIC SPECTROMETER. A DIGITAL SIMULATION OF THE PHOTOACOUSTIC EFFECT Ph.D. Thesis
Victor Alan Fishman 1980 185 p
Avail: Univ. Microfilms Order No. 8109164

A large scale computer simulation of the photoacoustic phenomenon was devised. The digital simulation is based on the thermal diffusion treatment of the system. The simulation does not depend on the steady state and can be used in the study of photoacoustic transient phenomena. The digital simulation allows for inclusion of thermal dissipative effects throughout the system, sample form, and cell geometry. The simulation results compare well to experiments using aqueous methylene blue dye solutions and single crystal gallium phosphide. The goal of separating sample optical and thermal properties can be achieved using the pulsed photoacoustic technique. A new design open-ended photoacoustic cell was developed and applied to a variety of large samples. Dissert. Abstr.

N81-25350 Stanford Univ., Calif.
CONSTRUCTION OPERATIONS DATA ACQUISITION AND PROCESSING VIA TIME LAPSE PHOTOGRAPHY INTERFACED TO A MINICOMPUTER Ph.D. Thesis
Ali Touran 1981 208 p
Avail: Univ. Microfilms Order No. 8109006

An interactive computer system has been developed for collecting and statistically preprocessing data pertaining to construction operations into a form usable by available simulation and planning systems. The input to the system is frame-counts corresponding to initiation and termination of construction activities extracted from time-lapse films. The inputs required for most analytical management tools in construction are activity duration times and cycles. Dissert. Abstr.

N81-25351*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MODULATED INFRARED RADIANT SOURCE
W. F. Stewart, S. Franklin Edwards, David S. Vann, and Royce F. McCormick Jun. 1981 15 p refs
(NASA-TM-83118; L-14365) Avail: NTIS HC A02/MF A01 CSCL 14B

A modulated, infrared radiant energy source was developed to calibrate an airborne nadir-viewing pressure modulated radiometer to be used to detect from Earth orbit trace gases in the troposphere. The technique used an 8 cm long, 0.005 cm diameter platinum-iridium wire as an isothermal, thin line radiant energy source maintained at 1200 K. A + or - 20 K signal, oscillating at controllable frequencies from dc to 20 Hz, was superimposed on it. This periodic variation of the line source energy was used to verify the pressure modulated radiometer's capability to distinguish between the signal variations caused by the Earth's background surface and the signal from the atmospheric gases of interest. Author

N81-25352*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DESIGN AND ANALYSIS OF A TORSION BRAID PENDULUM DISPLACEMENT TRANSDUCER
Emanuel Rind and Emmett L. Bryant Jun. 1981 63 p refs
(NASA-TP-1840; L-14183) Avail: NTIS HC A04/MF A01 CSCL 14B

The dynamic properties at various temperatures of braids impregnated with polymer can be measured by using the braid as the suspension of a torsion pendulum. This report describes the electronic and mechanical design of a torsional braid pendulum displacement transducer which is an advance in the state of the art. The transducer uses a unique optical design consisting of refracting quartz windows used in conjunction with a differential photocell to produce a null signal. The release mechanism for initiating free torsional oscillation of the pendulum has also been improved. Analysis of the precision and accuracy of the transducer indicated that the maximum relative error in measuring torsional amplitude was approximately 0. A serious problem inherent in all instruments which use a torsional suspension was analyzed: misalignment of the physical and torsional axes of the torsional member which results in modulation of the amplitude of the free oscillation. Author

N81-25353*# Pennsylvania State Univ., University Park. Dept. of Electrical Engineering.
THEORY AND TESTS OF A THERMAL ION DETECTOR SENSITIVE ONLY AT NEAR-NORMAL INCIDENCE
James W. Robinson Jun. 1981 55 p refs
(Grant NsG-3166)
(NASA-CR-164378) Avail: NTIS HC A04/MF A01 CSCL 14B

Measurements of thermal ions are influenced by factors such as spacecraft potential, velocity, angle of attack, and sheath size. A theory is presented for the response of an instrument which accepts ions only within a small angle of incidence from normal. Although a more general theory is available and forms the basis of this one, the small angle restriction allows a simpler formulation which does not depend on sheath size. Furthermore, practical instruments are easily designed around this restriction. Laboratory tests verify that such instruments respond as expected and they illustrate how design details influence perturbations from the ideal response characteristics. Author

N81-25354*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EVALUATION OF SEVERAL ULTRASONIC FLOWMETER TRANSDUCERS IN CRYOGENIC ENVIRONMENT
W. Clayton Moughon Apr. 1981 11 p ref
(NASA-TM-83117) Avail: NTIS HC A02/MF A01 CSCL 14B

Eighteen piezoelectric ultrasonic flowmeter transducers were laboratory tested to determine their suitability and long range reliability for use by the National Transonic Facility (NTF) to measure the flow rate of 450 Kg/sec of liquid nitrogen (LN2). Tests included thermally cycling each transducer 50 to 150 times over a temperature range of 295 K (ambient) to 77 K (LN2). The transducers were submerged in liquid nitrogen for 1 to 4 hours and the signal strength and quality noted. Results disclose that the current state-of-the-art ultrasonic flow transducers are very reliable and will meet the stringent requirements of the NTF. Author

N81-25355# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Ballistics Research Lab.
EXPERIMENTAL STUDY OF LIQUID-FILLED CYLINDER WITH UNEQUAL INTERNAL DIAMETERS Final Report
William P. DAmico, Jr. and Michael D. Fuller Jan. 1981 27 p refs Supersedes IMR-682
(DA Proj. 1L1-61101-A-91A)
(AD-A096800; AD-E430577; ARBRL-MR-03070; IMR-682) Avail: NTIS HC A03/MF A01 CSCL 19/1

A series of tests was conducted using a liquid-filled gyroscope to study the behavior of cylinders with dissimilar internal diameters. The discontinuity in the internal diameter of the container produced a lip that modified the characteristic liquid eigenfrequency of the cylinder and the amplitude behavior of the gyroscope. A simple correction for this unusual geometry can be formulated by using an average aspect ratio, which is based upon the volume and height of the container. The use of an average aspect ratio only grossly defines the differences between the gyroscope data and the available predictive models. R.C.T.

N81-25356# Ballistic Research Labs., Aberdeen Proving Ground, Md.
STRAIN-GAGE TECHNIQUES FOR STUDIES OF PROJECTILE BEHAVIOR DURING PENETRATION Final Report
G. E. Hauver Feb. 1981 46 p refs
(DA Proj. 1L1-61102-AH-43)

(AD-A098660; AD-E430598; ARBRL-MR-03082) Avail: NTIS HC A03/MF A01 CSCL 19/7

The behavior of long steel rods during the penetration of steel armor is being examined by strain measurements performed with foil resistance gages. Experiments in this investigation have employed both forward-ballistic and reverse-ballistic techniques. These techniques are described, and their advantages and disadvantages are discussed. Test data have been examined by a simple-wave analysis, and analytical results are discussed within the context of experimental problems. Preliminary efforts to assess the validity of measurements and analysis are described. GRA

N81-25357# Texas A&M Univ., College Station. Dept. of Electrical Engineering.

FEASIBILITY STUDY ON ADVANCED SOLID-STATE OXYGEN SENSORS Final Report, 29 Feb. - 30 Sep. 1980

Mooyoung Ham Dec. 1980 48 p refs

(Contract F33615-78-D-0629; AF Proj. 7930)

(AD-A098649; SAM-TR-80-44) Avail: NTIS HC A03/MF A01 CSCL 07/1

The three most widely known oxygen-sensing materials; stabilized ZrO2, ZnO, and TiO2 are comparatively reviewed. Gas-sensing MOS transistors and diodes that use Pd or Pt as a catalytic electrode material are described. GRA

N81-25358# California Univ., Berkeley. Lawrence Berkeley Lab.

KELVIN RARE GAS TIME-OF-FLIGHT PROGRAM

Matthew Vernon Mar. 1981 75 p refs

(Contract W-7405-eng-48)

(LBL-12422) Avail: NTIS HC A04/MF A01

The procedure for performing time-of-flight calibration measurements is detailed. The result of the calibration measurements is to assign a correct length to the path the molecules travel in a particular experimental configuration. In conjunction with time information a velocity distribution can then be determined. The program KELVIN is listed. DOE

N81-25359# Los Alamos Scientific Lab., N. Mex.

PHASE PROBE MEASURING SYSTEM IN THE UNILAC: PROBE DIMENSIONING AND SIGNAL EVALUATION

P. Strehl, J. Klabunde, V. Schaa, H. Vilhjalmsson, and D. Wilms Dec. 1980 74 p Transl. into ENGLISH from GSI 79-13 (W. Germany), Dec. 1979 73 p

(Contract W-7405-eng-36)

(LA-tr-80-43) Avail: NTIS HC A04/MF A01

Correct adjustment of the UNILAC accelerating structures are discussed. The adjustments require precise knowledge of the intensity distribution of the beam in a longitudinal phase space. Electromagnetic procedures can fill this role when the applied probes and the accessory signal preparation system is optimized with respect to the parameters to be observed. Several criteria in optimizing the probe are considered for UNILAC. The usefulness of the measurement system, for observations in the longitudinal phase space are demonstrated. DOE

36 LASERS AND MASERS

Includes parametric amplifiers.

N81-25360 Stanford Univ., Calif.

LASER ALLOYING AND CRYSTALLIZATION OF GERMANIUM AND GOLD-GERMANIUM THIN FILMS ON GALLIUM ARSENIDE Ph.D. Thesis

Richard Bracey Gold 1981 105 p

Avail: Univ. Microfilms Order No. 8108931

The use of lasers for semiconductor processing, motivated by the potential advantages associated with rapid, localized temperature transients as opposed to conventional furnace processing is explored for the alloying of gold-germanium ohmic contacts on gallium arsneide and for the crystallization of thin germanium films on gallium arsenide as well as amorphous substrates. Using a free-running pulsed ruby laser, and with a metallization system designed for low surface reflectivity, alloyed gold-germanium contacts were produced without damage to the exposed gallium arsenide. Thin films of germanium on gallium arsenide, in contrast, were transformed by scanning continuous wave laser irradiation to a periodic array of large-grain radial crystallites. This behavior was also observed for germanium films on amorphous substrates and, over a more limited range of experimental conditions, for silicon films on amorphous substrates. Dissert. Abstr.

N81-25361*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

VIBRATION CHARACTERISTICS OF A LASER HETERODYNE SPECTROMETER TUNABLE DIODE LASER SYSTEM USING A MECHANICAL COOLER PLATFORM

John J. Catherines and Joan W. Schwartz Apr. 1981 26 p (NASA-TM-83129) Avail: NTIS HC A03/MF A01 CSCL 20E

The Langley Research Center redesigned the cooler test bed hardware for the refrigerator for the purpose of isolating the tunable diode laser (TDL) from the cold tip in a laser heterodyne spectrometer system. Deflection in the lateral and vertical directions were managed on the cold tip and on the TDL. Measurements were analyzed over the frequency range of 0.100 Hz. The results show that the TDL responds approximately one order of magnitude less than that of the cold tip. The redesign of the system provided for adequately isolating the TDL for future operation. Author

N81-25362# Lincoln Lab., Mass. Inst. of Tech., Lexington.

CRYSTALLIZATION-FRONT VELOCITY DURING SCANNED LASER CRYSTALLIZATION OF AMORPHOUS Ge FILMS

Ralph L. Chapman, John C. C. Fan, Herbert J. Zeiger, and Ronald P. Gale 23 Apr. 1980 5 p refs

(Contract F19628-80-C-0002)

(AD-A096602; ESD-TR-80-210; JA-5109) Avail: NTIS HC A02/MF A01 CSCL 20/2

An optical transmission technique is used to measure the propagation velocity of the crystallization front during scanned laser crystallization of amorphous Ge films on fused-silica substrates. The measurements confirm a theoretical model for the solid-phase amorphous-to-crystalline transformation. According to this model, the periodic structural features of the crystallized films are formed because the crystallization front moves in a series of periodic jumps between rest positions, with the velocity of the front during each jump much higher than the laser scanning velocity. The measured values of the crystallization front velocity range from 140 to 260 cm/sec, compared with the laser scanning velocity of only 0.5 cm/sec. Author

N81-25363# Laser Diode Labs., Inc., New Brunswick, N.J.

RESEARCH AND DEVELOPMENT OF ADVANCED DESIGN INJECTION LASER DIODES Final Technical Report, Sep. 1978 - Sep. 1980

Thomas E. Stockton and Frank D. Speer Fort Monmouth, N.J. Army Communications Research and Development Command 30 Sep. 1980 56 p refs

(Contract DAAB07-77-C-2163)

(AD-A097754; DELNV-77-C-2163) Avail: NTIS HC A04/MF A01 CSCL 20/5

High peak power, pulsed GaInAsP/InP Large Optical Cavity (LOC) injection lasers emitting in the 1.0 to 1.3 micron region have been developed and studied under this program. This final report describes efforts directed toward the optimization of these devices and, in particular, concentrates on the following points: (1) Materials and structure development required to extend wavelength and peak power capability. (2) Process development connected with the fabrication of high power stripe geometry long wavelength lasers. (3) Package development and fiber coupling techniques for these devices. Excellent peak power performance, on the order of 4 mW per micron of junction length, was obtained for quaternary LOC laser diodes at a peak wavelength of 1.16 microns. In addition, greater than 25% coupling efficiency was demonstrated for 3 mil stripe quaternary LOC lasers coupled to 55 micron core graded index fiber. Peak optical power in excess of 75 mW was routinely obtained from the fiber pigtail. These devices are extremely well suited as sources for long haul, low bandwidth digital fiber optic systems where their high peak power capability can compensate for fiber darkening in high level radiation environments. Author (GRA)

N81-25364# Naval Postgraduate School, Monterey, Calif.
AERODYNAMIC STABILIZATION OF AN ELECTRIC DISCHARGE FOR GAS LASERS M.S. Thesis
Charles Herbert Davis Sep. 1980 105 p refs
(AD-A095010) Avail: NTIS HC A06/MF A01 CSCL 20/5

A subsonic, turbulent, diffuse discharge with potential application to electric discharge convection lasers is analyzed. Two methods of turbulence generation were investigated; a pulsed-jet ejector and a plate generator. Power inputs for various flow conditions are reported. Turbulence spectra for these flow conditions were studied and an effort made to optimize the discharge stabilizing properties of the flow. Plate generated turbulence proved superior for stabilizing the discharge. S.F.

N81-25365# Hughes Research Labs., Malibu, Calif.
OPTICAL-MICROWAVE INTERACTIONS IN SEMICONDUCTOR DEVICES Final Report, 30 Jun. 1978 - 31 Dec. 1980
L. Figueroa, C. W. Slayman, and H. W. Yen Mar. 1981 191 p refs
(Contract N00173-78-C-0192)
(AD-A098673) Avail: NTIS HC A09/MF A01 CSCL 20/5

The results of an extensive characterization of microwave-optical devices is presented. The study has concentrated in the optical injection locking of IMPATT oscillators, high-speed analog modulation of (GaAl)As injection laser, mode-locking of (GaAl)As injection laser, and high-speed optical detectors. GRA

N81-25366# McDonnell-Douglas Research Labs., St. Louis, Mo.
LASER RADAR ANALYSES Final Report, 15 Jul. 1979 - 15 Jul. 1980
J. C. Leader 15 Jul. 1980 75 p refs
(Contract N60921-79-C-0180; SF32399492)
(AD-A098513; MDC-Q0714) Avail: NTIS HC A04/MF A01 CSCL 20/5

General integral expressions for the power signal and power signal-to-noise ratio arising from laser heterodyne detection of a distorted optical phase front are derived. Specific analytical results for the efficiency of heterodyne detection are derived for a generalized transceiver system that include the effects of local oscillator and receiver aperture size and focal lengths as well as the amplitude radius of the Gaussian local oscillator. Efficiency effects are calculated assuming the phase front distortions arise from target scattering of a laser signal (speckle effects) and scintillation resulting from atmospheric turbulence. Specific numerical calculations of the signal-to-noise ratio efficiency illustrate the degradation in signal-to-noise ratio resulting from diffuse scattering from extended targets at close range and atmospheric turbulence effects at long range. These calculations indicate the requirement for a minimum receiving aperture size (commensurate with total received signal requirements) and a uniform local oscillator beam that underfills the target image (on the photocathode) for optimum laser radar efficiency. GRA

N81-25367# Cornell Univ., Ithaca, N. Y. Lab. of Atomic and Solid State Physics.
CO2 LASER ABSORPTION AND SATURATION STUDIES OF MOLECULAR IMPURITIES IN ALKALI HALIDE CRYSTALS
A. J. Sievers Dec. 1980 45 p refs
(Contract DE-AS08-78DP-40013)
(DOE/DP-40013/1) Avail: NTIS HC A03/MF A01

The equilibrium and nonequilibrium dynamical properties of ReO4(+) molecules embedded in alkali halide lattices was explored using electromagnetic radiation. Both incoherent sources and CO2 laser radiation were used to explore the full dynamic range of the molecular vibrational models. Stable molecular dopant (alkali halide) combinations were fabricated which have vibrational modes near the CO2 laser frequencies. In order to uncouple the molecular modes from the lattice modes, to simplify the analysis as much as possible, low temperature spectroscopic measurements were required. In general, it was found that the molecular vibrational modes in the low temperature quiescent lattice had extremely narrow linewidths (less than 0.1 cm (+1)) so that most of the coincidences with the CO2 laser lines were eliminated. DOE

N81-25368# TRW Systems and Energy, Redondo Beach, Calif.
FLUID MECHANICS OF FUSION LASERS Final Report, 11 Sep. 1978 - 5 Jun. 1980
J. Shwartz, V. A. Kulkarny, D. A. Ausherman, H. H. Legner, and B. Sturtevant 1980 233 p refs
(Contract DE-AC08-78DP-40070)
(DOE/DP-40070/1) Avail: NTIS HC A11/MF A01

Flow loop components required to operate continuous flow, repetitively pulsed CO2 and KrF laser drives for ICF were identified and their performance requirements were specified. It was found that the laser flow loops can have a major effect on the laser beam quality and overall efficiency. The pressure wave suppressor was identified as the most critical flow loop component. The performance of vented side wall suppressors was evaluated both analytically and experimentally and found capable of meeting the performance requirements of the CO2 and KrF fusion lasers. All other laser flow loop components are essentially similar to those used in conventional, low speed wind tunnels and are therefore well characterized and can be readily incorporated into fusion laser flow systems designs. DOE

N81-25369# Sandia Labs., Livermore, Calif.
DUAL-BEAM, SECOND-DERIVATIVE TUNABLE DIODE-LASER INFRARED SPECTROSCOPY APPLIED TO TRACE-GAS MEASUREMENT
D. R. Tallant and R. G. Jungst Apr. 1981 23 p refs
(Contract DE-AC04-76DP-00789)
(SAND-80-0755) Avail: NTIS HC A02/MF A01

A dual base diode laser spectrometer was constructed using off axis reflective optics. The spectrometer was amplitude modulated for direct absorption measurements or frequency modulated to obtain derivative spectra. The spectrometer had: high throughput; was easy to operate and align; provided good dual beam compensation; and had no evidence of the interference effects that were observed in diode laser spectrometers using refractive optics. Unpurged, using second derivative techniques, the instrument measured 108 parts per million CO (10/cm absorption cell, atmospheric pressure broadened) with good signal/noise. With the replacement of marginal instrumental components, the signal/noise was substantially increased. This instrument was developed to monitor the evolution of decomposition gases in sealed containers of small volume at atmospheric pressure. DOE

N81-26007# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
A CO2 LASER DELIVERING INTENSE PULSES AT HIGH REPETITION RATES
Jean Bonnet, Gerard Fournier, and Daniel Pigache *In its* La Rech. Aerospatiale, Bi-Monthly Bull., No. 1980-4 (ESA-TT-672) Mar. 1981 p 83-85 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-4, Jul. - Aug. 1980 p 297-299 Original report in FRENCH previously announced as A80-52919/4 (For primary document see N81-26000 16-99)
Avail: NTIS HC A05/MF A01

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N81-25370* National Aeronautics and Space Administration. Pasadena Office, Calif.
HOT GAS ENGINE WITH DUAL CRANKSHAFTS Patent
Allan R. McDougal, inventor (to NASA) (JPL, California Inst. of Technology, Pasadena) Issued 17 Mar. 1981 13 p Filed 19 May 1978 Supersedes N78-25431 (16 - 16, p 2123) Sponsored by NASA
(NASA-Case-NPO-14221-1; US-Patent-4,255,929; US-Patent-Appl-SN-907431; US-Patent-Class-60-517; US-Patent-Class-60-525) Avail: US Patent and Trademark Office CSCL 13I

A hot gas engine, such as a Stirling engine is described which comprises a displacer portion and an expander portion with a heat exchanger connected between them. The expander portion has a piston which is operatively connected to and rotates an expander crankshaft. In like manner, the displacer

portion is provided with a piston which is also operatively connected to and rotates with a separate displacer crankshafts. The two crankshafts are synchronized with respect to each other preferably by means of an idler gear. Banks of displacer pistons can also be provided for operation on a common displacer crankshaft and banks of cooperating expander pistons also can be provided for operation on a common expander crankshaft.

Official Gazette of the U.S. Patent and Trademark Office

N81-25371* National Aeronautics and Space Administration. Pasadena Office, Calif.

SANDBLASTING NOZZLE Patent

Gerald S. Perkins (JPL, California Inst. of Technology, Pasadena), Eugene V. Pawlik (JPL, California Inst. of Technology, Pasadena), and Wayne M. Phillips, inventors (to NASA) (California Inst. of Technology, Pasadena) Issued 24 Feb. 1981 12 p Filed 17 Feb. 1976 Supersedes N77-17466 (15 - 08, p 1040) Sponsored by NASA

(NASA-Case-NPO-13823-1; US-Patent-4,252,768; US-Patent-Appl-SN-658487; US-Patent-Class-264-332; US-Patent-Class-106-43) Avail: US Patent and Trademark Office CSCL 13I

A nozzle for use with abrasive and/or corrosive materials is formed of sintered ceramic compositions having high temperature oxidation resistance, high hardness and high abrasion and corrosion resistance. The ceramic may be a binary solid solution of a ceramic oxide and silicon nitride, and preferably a ternary solid solution of a ceramic oxide, silicon nitride and aluminum nitride. The ceramic oxide is selected from a group consisting of Al2O3, Y2O3 and Cr2O3, or mixtures of those compounds. Titanium carbide particles are dispersed in the ceramic mixture before sintering. The nozzles are encased for protection from external forces while in use by a metal or plastic casing.

Official Gazette of the U.S. Patent and Trademark Office

N81-25372# Committee on Interstate and Foreign Commerce (U. S. House).

AUTOMOTIVE FUEL ECONOMY

Washington GPO 1980 122 p Hearing on H. R. 6943 and H. R. 5140 before the Subcomm. on Consumer Protection and Finance of the Comm. on Interstate and Foreign Com., 96th Congr., 2nd Sess., 5 May 1980

(GPO-69-331) Avail: Subcommittee on Consumer Protection and Finance

Measures to increase automotive fuel economy are discussed, including flexibility in automaker compliance with government standards. Cooperation and technology exchange with foreign car producers are proposed in order to enhance fuel economy and the job market. S.F.

N81-25373# European Space Agency, Paris (France).

PROCEEDINGS OF THE SECOND SPACE TRIBOLOGY WORKSHOP

Gabrielle Levy, ed. 1980 152 p refs Presented at Risley, England, 15-17 Oct. 1980 Prepared in cooperation with Nattional Centre of Tribology

(ESA-SP-158; ISSN-0379-6566) Avail: NTIS HC A08/MF A01

The presentations and ensuing discussions cover bearings, bearing materials, and sliding surfaces were discussed as well as lubricants (wet and dry), gears, and slip rings. Emphasis was placed on long-life applications. Test results obtained over the past four years as well as a method of calculating the torque in dry lubricant ball bearings and the torque of bearings while oscillating through small angles are presented. Results on wear for dry lubrication slip ring materials and the current status of lead film bearing lubrication are reported. For individual titles, see N81-25374 through N81-25391.

N81-25374# Laboratoire Mediterraneen de Recherches Thermodynamiques, Nice (France).

SLIDING AND ROLLING BEARINGS FOR PIVOT SYSTEMS

M. Maillat, H. Boving, and H. E. Hinterman *In* ESA 2nd Space Tribology Workshop 1980 p 3-8 refs (For primary document see N81-25373 16-37)

Avail: NTIS HC A08/MF A01

Sliding and ball bearings were load tested in dry air and in a vacuum. Bearing substrates of hardened AISI 440 C steel with TiC and TiN coatings were examined with and without MoS2 lubricant. Test movement consisted of 1 million oscillations (+ and - 30 deg) at 5 Hz with a sinusoidal speed variation. Under vacuum, maximum allowable loads and suitable coatings are found for sliding bearings of 3 mm dia (axial and radial load 10 N; TiC or TiN-coated pivots, coated with MoS2 and TiC coated shafts) and for ball bearings outer dia 13 mm, inner dia 4 mm (axial load 10 N, radial load 50 N; TiC coated balls or rings with MoS2 coated inner rings). Sliding bearing torques are more constant with time over the complete oscillation angle, but are an order of magnitude higher than the rolling bearing torques. In general, TiC coatings act as diffusion barriers, the MoS2 lubrication being useful in obtaining lower friction and a longer lifetime. Ball bearings, when the coating and loading combinations are favorable, show better results in vacuum than in air. Author (ESA)

N81-25375# National Centre of Tribology, Risley (England).

TORQUE EFFECTS OVER SMALL ANGLES OF MOVEMENT OF BALL BEARINGS

K. T. Stevens and M. J. Todd *In* ESA 2nd Space Tribology Workshop 1980 p 9-15 refs (For primary document see N81-25373 16-37)

Avail: NTIS HC A08/MF A01

Pairs of matched, preloaded (100N) angular contact bearings were tested and plots of torque against angular displacement are obtained. Lubricants included lead film, BP135 oil and MoS2. Bearings were in lead bronze and phenolic cages. A device caused a sinusoidal oscillation with a period of 30 sec to be given to the outer races of the bearing pair. Measured torque of typical bearings oscillated over 0.01 to 1.5 deg of arc shows a predominantly elastic hysteresis behavior, i.e., the torque versus angle plots are loops which are shallow at low angles and become broader at higher angles within this range. Equilibrium rolling is established only when the ball has rolled forward a distance of approximately 1.5 times the semi-minor axis of the Hertz ellipse. This observation agrees with the theoretical prediction for pure rolling even though, in the ball bearing, there must be a component of ball spin at one of the races. Small effects of adhesion are noted when lead and MoS2 films are used as lubricant.

Author (ESA)

N81-25376# Saab-Scania, Linkoping (Sweden).

A TEST OF THE TORQUE LOSS OF A PLATFORM AXIS DURING AXIS OSCILLATING MOVEMENTS

R. Persson *In* ESA 2nd Space Tribology Workshop 1980 p 17-22 refs (For primary document see N81-25373 16-37)

Avail: NTIS HC A08/MF A01

Measurements of temperature gradients, amount of axial displacement during temperature cycling, average torque loss, and torque loss ripple for the elevation axis of a pointing and hold mount were made. The bearing support and preload is based on the use of an o-ring as the main load carrying element, with only the bearings themselves being lubricated. Measurements were taken in a thermal vacuum chamber using thermocouples, inductive sensors, a strain gage bridge and a laser. A quadrupole mass spectrometer is used to determine residual gas composition. Average torque loss is 0.1 Nm and the torque loss ripple of the magnitude < or = 0.05 Nm with some peaks in the ripple of 0.15 Nm. Author (ESA)

N81-25377# National Centre of Tribology, Risley (England).

TEST RESULTS DURING REAL LIFE TEST OF A DORNIER DESPIN MECHANISM (5 OF 7 YEARS COMPLETED)

A. J. Walton and K. Parker *In* ESA 2nd Space Tribology Workshop 1980 p 23-28 refs (For primary document see N81-25373 16-37)

Avail: NTIS HC A08/MF A01

A thermal vacuum life test of a medium speed despin mechanism, containing molybdenum disulfide and oil as lubricants is described. Temperatures within the vacuum environment are regularly changed to simulate those which are likely to occur in space. Daily measurements are made of motor voltage, motor current, slip ring voltage drop, and the temperature distribution within the mechanism which rotates at 60 rpm. An Aeroflex brushless dc motor drives the shaft. The power slip rings have silver surfaces, each with silver/copper composite brushes.

Molecular shaft seals and anticreep barriers are used to prevent oil loss. The mechanism has operated for 5 years (1.5 x 10 to the 8th power revolutions) within specifications. A small gradual decrease in motor current is noted. Instrumentation techniques and details of test results are given. Author (ESA)

N81-25378# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).

DESIGN FEATURES OF THE DORNIER MEDIUM SPEED MECHANISM

R. G. Hostenkamp *In* ESA 2nd Space Tribology Workshop 1980 p 29-33 refs (For primary document see N81-25373 16-37)

Avail: NTIS HC A08/MF A01

The modular design of the mechanism is described. The drive module contains the bearings with preload device and lubrication system, motor and resolver, a position and speed pickup and inductive signal transmitters. Electrical power is transferred from the stationary to the rotating section via slip rings which are housed in a separate module. The launch loads bypass the bearings through an off load device. Liquid lubrication (BP 110) is applied to the bearings with a thin grease (BP 2110) film on the races and balls. Porous cages and reservoirs are impregnated with oil and labyrinth seals and creep barriers are used to reduce oil losses. Author (ESA)

N81-25379# University Coll., London (England). Space Science Lab.

SMALL STEPPING MOTORS IN SPACE

T. J. Patrick *In* ESA 2nd Space Tribology Workshop 1980 p 37-38 refs Sponsored by British Science Research Council (For primary document see N81-25373 16-37)

Avail: NTIS HC A08/MF A01

Recent experience (1974 to 1980) covering the testing and orbital operation of small permanent magnet stepping motors on the ARIEL 5, ARIEL 6 and Solar Maximum Mission scientific satellites is reviewed. Most incorporate the small permanent magnet stepping motor (IMC 08-845) which rotates 90 deg per step on Barden Bar-Temp bearings having a ball cage made of a composite of PTFE and molybdenum disulfide, glass fiber reinforced. Lubrication is by the laying of solid lubricant particles on the ballraces as the ball cage slowly wears. The life expectancy was calculated for typical loads, at 10 to the 10th power revolutions. For the actuation of shutter, filter, calibration, and gas dump devices on X-ray telescopes and spectrometers, ball bearings are used with solid lubricant, gear mechanisms without lubricant, gear heads and leadscrews with low vapor pressure grease. Author (ESA)

N81-25380# Societe Europeenne de Propulsion, Vernon (France).

DESIGN CONSIDERATIONS ON THE SOLAR ARRAY DRIVE MECHANISM DEVELOPED FOR SPOT

J. Cabillic and J. P. Fournier *In* ESA 2nd Space Tribology Workshop 1980 p 39-42 (For primary document see N81-25373 16-37)

Avail: NTIS HC A08/MF A01

The ball bearing and slip ring assembly as well as the pyrotechnic system for unloading the bearings after launch are described. Lead lubricated angular contact ball bearings in a lead-bronze cage moderately preloaded by a diaphragm are used. A redundant pyrotechnic wire cutter unclamps the system. Silver, small diameter slip ring disks of modular design are used for power and signal transmission. Brushes are of a sintered composite of silver, molybdenim disulfide and copper. To meet stiffness requirements and reduce mean friction torque, a preload of 100N and a bearing contact angle of 25 deg are used. Author (ESA)

N81-25381# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost.

LUBRICATION AND WEAR OF A STAINLESS STEEL ACTUATING CABLE

G. F. Brouwer *In* ESA 2nd Space Tribology Workshop 1980 p 43-48 refs (For primary document see N81-25373 16-37)

Avail: NTIS HC A08/MF A01

Wear tests in thermal vacuum and in air were performed on cable types to be used on the experiment table in the Spacelab scientific airlock. Nonjacketed stainless steel cables (MIL-W-83420) of 7 by 7 and 7 by 19 construction, vacuum lubricated with Fomblin Y140-13 were cycled over small diameter pulleys of aluminum or Vespel. Tensile tests were performed to determine residual strength. The 7 by 7 cable is found to be marginal while contact stresses are too high with the aluminum pulleys. When used with Vespel pulleys, 7 by 19 cable lubricated with a minimum of 1 micron of Fomblin meets the qualifications. Author (ESA)

N81-25382# European Organization for Nuclear Research, Geneva (Switzerland).

ULTRA-HIGH-VACUUM TESTS AND EXPERIENCE WITH A LONG-LIFE, HEAVY-DUTY, OSCILLATING ROD END PIVOT FOR THE MOVABLE FERRITE SHUTTERS OF THE CERN ANTIPROTON ACCUMULATOR

A. Poncet *In* ESA 2nd Space Tribology Workshop 1980 p 49-55 refs (For primary document see N81-25373 16-37)

Avail: NTIS HC A08/MF A01

Bearing materials for use in ultrahigh vacuum which meet the requirement for loads of 700 N and 3 x 10 to the 7th power cycles were tested. Low outgassing rates, radiation resistance, bakeability and resistance to dynamic shocks with peak force amplitudes of 7000 N are additional requirements. Full scale tests were performed on Ni-Fe-Cu, stainless steel with various coatings, lubricated polyimides and impregnated polytetrafluoro-ethylene (PTFE). A polyimide + lead bearing material and a PTFE - lead impregnated porous bronze metal backed bearing are found suitable, with the latter chosen because of lower outgassing. Bearing material composition, commercial names, and summaries of test data are given. Author (ESA)

N81-25383# Teldix Luftfahrt-Ausruestungs G.m.b.H., Heidelberg (West Germany).

THE INFLUENCE OF FIVE YEARS OF STORAGE ON THE OPERATIONAL READINESS OF A SATELLITE FLYWHEEL

D. Rapp *In* ESA 2nd Space Tribology Workshop 1980 p 57-61 refs (For primary document see N81-25373 16-37)

Avail: NTIS HC A08/MF A01

The influence of long term storage on TELDIX momentum wheels was investigated. The qualification model from the SYMPHONIE program was investigated after storage. All typical functional data were compared with the earlier qualification results to check any possible storage changes. After disassembling the momentum wheel, all main parts were examined. Special investigations were performed on the ball bearing unit and its parts, on the motor and on the electronics. A small leak in a solder joint caused an internal pressure increase resulting in a 17% current consumption increase. No other changes in pre-storage qualification values are noted. Author (ESA)

N81-25384# National Centre of Tribology, Risley (England).

BOUNDARY LUBRICATION OF STEEL BY VARIOUS OILS OF LOW VAPOR PRESSURE

A. Thomas *In* ESA 2nd Space Tribology Workshop 1980 p 65-68 (For primary document see N81-25373 16-37)

Avail: NTIS HC A08/MF A01

In order to provide data for ball bearing torque calculations and to compare the lubricity of a number of space approved lubricant oils, a series of sliding tests were performed using conventional ball bearing steel (52100). Wear measurements were taken intermittently after 25, 100, 500, and 1000 revolutions by optical examination of the ball wear scar dimensions. To ensure that a boundary lubrication regime existed during the oil tests, the electrical contact resistance between the pins and disk was monitored continously. The friction traces of all the oils remained practically constant throughout the 1000 revolution tests. Apiezon C exhibits the highest mean friction coefficient at 0.202 + or - 0.03, while the other four oils, BP110, KG80, BP135 and Fomblin Z25, have mean friction coefficients of 0.13 + or - 0.015, 0.13 l or - 0.02, 0.12 + or - 0.015, and 0.12 + or - 0.02, respectively. The wear rate and friction of steel balls sliding on an oil covered steel disk in air are not strongly dependent on oil type, except when using the highly refined mineral oil (Apiezon C) which gives a higher friction coefficient than the other oils. Author (ESA)

N81-25385# National Centre of Tribology, Risley (England).

SOME NEW OBSERVATIONS ON WEAR IN OIL LUBRICATED SATELLITE BALL BEARINGS

K. T. Stevens *In* ESA 2nd Space Tribology Workshop 1980 p 69-80 refs (For primary document see N81-25373 16-37)
Avail: NTIS HC A08/MF A01

Pairs of angular contact bearings were tested at 10 rpm for 7 days for wear and torque in air and vacuum, using five low vapor pressure oils in a boundary lubrication regime. Wear measurements were made using optical and electron microscopy, surface profilometry and ferrography. Oils tested were BP135, BP110, KG80, Fomblin Z25 and Apiezon C. Micropitting, with pit sizes to 4 microns wide by 0.1 to 0.5 microns deep is the predominant form of ball and race damage. Pitting occurred to the same degree in air and vacuum with all test oils, leading to the conclusion that the choice of lubricant for variable speed bearings in spacecraft applications can be made on the basis of vapor pressure and viscosity without regard to boundary lubricating properties. Author (ESA)

N81-25386# Teldix Luftfahrt-Ausruestungs G.m.b.H., Heidelberg (West Germany).
EXPERIENCES WITH SHOCK PULSE MEASURING EQUIPMENT GAINED DURING VERIFICATION AND LIFE TESTING OF SPACE BALL BEARINGS
W. Auer and G. Nieder *In* ESA 2nd Space Tribology Workshop 1980 p 81-85 refs (For primary document see N81-25373 16-37)
Avail: NTIS HC A08/MF A01

A shock transducer, using a resonance frequency of 35 kHz, was used to observe run-in, check speed behavior, monitor temperature and overlubrication, and check for bearing retainer motion. The measured shock pulse values are not used as an absolute measure of the state of a component, but only as a means for a relative comparison over time. Strip chart traces are shown for shock pulses resulting from irregular retainer motion, oil jacks, and temperature transients. The method is in use for monitoring a life test of a momentum wheel, for verification of ball bearing lots; and tests during production of momentum and reaction wheels. Author (ESA)

N81-25387# National Centre of Tribology, Risley (England).
A METHOD FOR THE CALCULATION OF TORQUE IN DRY-LUBRICATED BALL BEARINGS INCLUDING THE INFLUENCE OF TEMPERATURE AND FIT
M. J. Todd *In* ESA 2nd Space Tribology Workshop 1980 p 87-93 refs (For primary document see N81-25373 16-37)
Avail: NTIS HC A08/MF A01

A model of ball motion for estimating average torque which includes microslip, hysteresis and spin, is described. The sliding friction coefficient for the desired lubricant is the only measurement required. If viscous effects are absent, the method is also applicable to liquid lubricated bearings. Equations are given for calculation of contact angle, ball load, then torque under an assumed temperature distribution and with given initial fits and bearing preload. Computed values are shown to agree reasonably well with measurements. The literature on bearing torque theory is summarized. Author (ESA)

N81-25388# National Centre of Tribology, Risley (England).
CURRENT STATUS OF LEAD LUBRICATION OF BALL BEARINGS
A. Thomas, A. L. Garnham, and M. J. Todd *In* ESA 2nd Space Tribology Workshop 1980 p 97-103 refs (For primary document see N81-25373 16-37)
Avail: NTIS HC A08/MF A01

The use of ion plated thin lead films is reviewed, and comparisons made with other solid lubricant films (gold). Lead ion-plated films are shown to perform better in practice than a number of alternative solid lubricants. The performance and limitations of lead ion plated bearings fitted with lead bronze cages is discussed and a number of test results on lead ion plated bearings with various cage materials are detailed. Alternative bearing configurations are discussed, with some examples, with the aim of reducing debris generation and thereby improving the long term torque performance. Author (ESA)

N81-25389# National Centre of Tribology, Risley (England).
EXPERIMENTAL OBSERVATIONS ON TORQUE VARIATION CAUSED BY BALL BEARING CAGE INSTABILITIES
K. T. Stevens *In* ESA 2nd Space Tribology Workshop 1980 p 105-114 refs (For primary document see N81-25373 16-37)
Avail: NTIS HC A08/MF A01

The effect of cage vibrations on the torque of angular contact ball bearings was measured for a number of different lubricants and cage designs. Angular contact bearings with phenolic cages were tested with BP135, BP110, KG80, and Z25 oils, and with BP8135 and BP2110 greases. After run-in, bearings were rotated at 4500 rpm, with torque and speed being measured as the system came to rest. Cage instabilities observed are of three types. The first is a radial vibration in the form of a high frequency whirl. Under starved or marginal lubrication, it leads to significant torque increases, but under conditions of flooded lubrication torque decreases. The instability is more prevalent with oils of high viscosity and occurs with both inner and outer race riding cages. It can be eliminated by adopting a nonuniform ball pocket spacing in the cage. The second instability is a high frequency, erratic axial motion giving a large torque increase. It occurs with any cage design but only when the ball/pocket clearance is excessive. The third instability takes the form of a periodic (low frequency) change in the running position of an outer-race riding cage and results in only a small torque penalty. Author (ESA)

N81-25390# National Centre of Tribology, Risley (England).
WORK IN PROGRESS ON A HIGH-PRECISION RADIOMETER MIRROR DRIVE
M. J. Todd, A. J. Walton, and J. A. Duvall *In* ESA 2nd Space Tribology Workshop 1980 p 115-128 refs (For primary document see N81-25373 16-37)
Avail: NTIS HC A08/MF A01

Commercial ball bearings were evaluated for their attainable precision and speed jitter, as possible mirror support bearings for the Ocean Color Monitor radiometer. A theoretical assessment of possible bearing systems, measurements of radial stiffness and run-out on ultrahigh precision shafts and bearings were made. A Moire fringe goniometer was used to determine actual rotational speed variations. Total conical centers run-out of the journals of a machined aluminum alloy shaft, fitted with selected bearings, met the criteria in two cases out or three. Radial stiffness was satisfactory and of the order predicted. With conventional oil lubrication of the bearings there were fractional speed errors between successive revolutions over 1 deg scans (the smallest angle measurable with the goniometer) of approximately 0.08%. Allowing for the inertia difference from the actual scanning mirror system, this error reduces to 0.002% of the mean angular velocity. It is not yet known whether this satisfies the criterion for speed jitter. Author (ESA)

N81-25391# European Space Research and Technology Center, Noordwijk (Netherlands).
THE WEAR AND ELECTRICAL CHARACTERISTICS OF SOME DRY-LUBRICATED SLIP RING/BRUSH CONTACTS
J. C. Anderson *In* ESA 2nd Space Tribology Workshop 1980 p 129-136 refs (For primary document see N81-25373 16-37)
Avail: NTIS HC A08/MF A01

Composite brushes (Ag, Cu, MoS2) and coin silver slip rings were tested. In long-term, medium speed tests, the wear and electrical noise of some specially prepared hot pressed brush materials with between 5 and 15% MoS2 were compared with a similar, commercially available, cold pressed brush material. The effect of brush load on brush/ring dynamic contact resistance was measured for currents up to 10 amps. Two sizes of conformed brushes, 5 mm square and 27 mm square were used. For brush contact loads between 25 and 500 g, the contact resistance, for a given current, of the larger brushes was always lower, particularly at low brush loads. This results in a lower power loss and temperature rise at the larger brush contacts. Composites with a low level of MoS2 (5 and 7.5% by weight) exhibit low electrical noise, but their wear rates are significantly higher than the commercial composite. Author (ESA)

N81-25392# Oklahoma State Univ., Stillwater. Div. of Engineering, Technology and Architecture.
ASSESSMENT AND RATING OF THE CONTAMINANT SENSITIVITY OF RELIEF VALVES Final Report, 1 Oct. 1979 - 30 Sep. 1980
James R. Gillum Oct. 1980 144 p refs
(Contract DAAK70-79-C-0154)
(AD-A094680; OSU-FPRC-M111980) Avail: NTIS

HC A07/MF A01 CSCL 13/11

A test and evaluation method was developed for the contaminant sensitivity of fluid power pressure relief valves. The background research, test development, and test verification results are discussed. The proposed SAE standard procedure for relief valve contaminant sensitivity verification is included. A rating method for the contaminant sensitivity of relief valves is also presented. R.C.T.

N81-25393# Calspan Advanced Technology Center, Buffalo, N.Y. Aerodynamic Research Dept.

A COMPUTER PROGRAM FOR THE IVES TRANSFORMATION IN TURBOMACHINERY CASCADES Interim Report

William J. Rae Nov. 1980 67 p refs

(Contract F39620-78-C-0057; AF Proj. 2307)

(AD-A096416; AFOSR-81-0154TR; CALSPAN-6275-A-3) Avail: NTIS HC A04/MF A01 CSCL 09/2

The transformation capable of transforming a cascade of airfoils into a rectangle, thus facilitating the application of the solution algorithms, is described. The transformation itself is reviewed, together with a practical numerical procedure for applying it to a given cascade. A number of choices, involving branch-point locations, tolerances for various iteration sequences, and formulas for the evaluation of certain special functions, are involved in the procedure. S.F.

N81-25394# Massachusetts Inst. of Tech., Cambridge. School of Chemical Engineering Practice.

DEVELOPMENT OF A PACKED-BED LETDOWN VALVE FOR COAL LIQUEFACTION PLANTS

R. A. Hulseman, G. H. Kemker, Jr., and S. F. Sciamanna Mar. 1981 58 p refs Prepared jointly with ORNL

(ORNL/MIT-321) Avail: NTIS HC A04/MF A01

Pressure letdown of coal liquefaction slurry from high pressure (13.9 mPa or 2000 psig), high temperature (730 K) reactor/dissolvers is accomplished using a packed bed. This concept resolves the erosion problem which accompanies the use of conventional valves. Three-phase slurry letdown was simulated using two-phase concurrent upflow, with packed bed pressure drops to 8.3 mPa (1200 psig). A semiempirical model predicting the pressure gradient for two phase, concurrent upflow in a packed bed is presented. Packed bed letdown valve designs which control linear slurry velocity and minimize erosion are presented. Cost analysis indicates carbon steel is an acceptable packing material. DOE

N81-25395# Department of Energy, Morgantown, W. Va. Energy Technology Center.

SOLIDS THROTTLING VALVES FOR COAL CONVERSION AND UTILIZATION DEVELOPMENT Final Report

G. C. Sine Nov. 1980 125 p refs

(Contract DE-AC21-79MC-12186)

(DOE/MC-12186/126) Avail: NTIS HC A06/MF A01

A test loop was designed for slurry letdown valves that are compatible with the existing pilot plant and would have a minimum impact on pilot plant operation. The design effort was divided into four task areas: (1) data acquisition and evaluation; (2) conceptual layouts; (3) detailed design drawings; and (4) specifications. Design requirements and criteria were developed from the information obtained from interviews with pilot personnel as well as with personnel from supporting agencies. Basic design decisions such as materials of construction, instrumentation, number of test loops, and data acquisition equipment resulted from this effort. Conceptual layouts were prepared using the information obtained from the data acquisition effort and actual field measurements made during visits to the pilot plant. R.C.T.

N81-25396# *Curtiss-Wright Corp., Wood-Ridge, N.J. Power* Systems Div.

HIGH TEMPERATURE TURBINE TECHNOLOGY PROGRAM. *PHASE 2: TECHNOLOGY TEST AND SUPPORT STUDIES* Annual Technical Progress Report, 1 Jan. - 31 Dec. 1979

Jan. 1980 323 p

(Contract DE-AC01-76ET-10348)

(DOE/ET-10348/T1; FE-2291-62; CW-WR-76-020.62) Avail: NTIS HC A14/MF A01

Objectives of the program elements as well as technical progress and problems encountered during this Phase III annual reporting period are described as well as progress on design, fabrication and checkout of test facilities and test rigs. LP turbine cascade tests were concluded. A total of 350 hours of testing was conducted on the LP rig engine first with clean distillate fuel and then with fly ash particulates injected into the hot gas stream. The design and fabrication of the turbine spool technology rig components are described. TSTR 600 sector combustor rig fabrication and testing and progress in the design and fabrication of TSTR cascade rig components for operation on both distillate fuel and low Btu gas are considered. The new coal-derived gaseous fuel synthesizing facility is reviewed. Results and future plans for the supporting metallurgical programs are discussed. DOE

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N81-25397# Northrop Corp., Hawthorne, Calif. Aircraft Div.

IMPROVED LOW FREQUENCY EDDY CURRENT INSPECTION FOR CRACKS UNDER INSTALLED FASTENERS Final Report, Jul. 1979 - Oct. 1980

D. T. Mih Wright-Patterson AFB, Ohio AFWAL Oct. 1980 91 p

(Contract F33615-79-C-50542; AF Proj. 2418)

(AD-A098543; NOR-80-142; AFWAL-TR-80-4150) Avail: NTIS HC A05/MF A01 CSCL 14/2

The purpose of this program was to establish the feasibility of using low frequency eddy current (LFEC) techniques to inspect the second layer of a built up aluminum structure for hole cracking, with the titanium fasteners installed. This program pursued two parallel approaches for low frequency eddy current inspection. One approach was with centered field excitation in the fastener hole. The second approach was with off-center field excitation in the fastener hole. The program consisted of two tasks. The first task was to optimize the probes for both approaches, and involved analysis, design, optimization of probes, and testing of various unique driver/sensor combinations. The second task was to develop inspection techniques with the optimized probes on notched specimens containing flush-head titanium fasteners with appropriate signal processing and display. It has been shown that it is feasible and practical to use LFEC multisegment or circular array probe to detect 0.1 inch radial depth notch underneath 0.25 inch thick aluminum alloy skin, with titanium fasteners in place. Author (GRA)

N81-25398# Boeing Aerospace Co., Seattle, Wash.

LOW COST HIGH VOLUME RADIOGRAPHIC INSPECTION

Ned M. Lowry, Helen J. Abplanalp, and Jon M. Tanke Redstone Arsenal, Ala. Army Missile Command Jan. 1981 239 p refs

(Contract DAAK40-78-C-0197; Proj. MM/T)

(AD-A098658; AD-E950114; D180-26159-1; DRSMI/RS-CR-81-1) Avail: NTIS HC A11/MF A01 CSCL 13/8

This document describes a prototype non-film radiographic inspection system designed to perform rapid assembly configuration verification of large complex assemblies. The system includes capabilities for: (1) real time X-ray radiography; (2) digital image enhancement; (3) remote part positioning and manipulation; and (4) computer aided inspection. The advantages and limitations of each of these capabilities are discussed. A cost/benefit analysis is also included. Author (GRA)

N81-25399# *Naval Civil Engineering Lab., Port Hueneme, Calif.*

NONDESTRUCTIVE TEST EQUIPMENT FOR WIRE ROPE Progress Report, Sep. 1979 - Sep. 1980

H. H. Haynes and L. D. Underbakke Oct. 1980 36 p

(AD-A096853; TN-1594) Avail: NTIS HC A03/MF A01 CSCL 11/6

Nondestructive test equipment for inspecting steel wire ropes was evaluated in laboratory and field tests. Individual ac/dc units and a unitized ac/dc unit were tested on wire rope to detect broken wires and loss of metallic area from wear and

corrosion. The unitized ac/dc units used Hall effect sensors to pick up the defects as opposed to sensor coils used in the individual ac/dc units. The Hall effect sensors enabled less equipment to be used to conduct a complete inspection and also permitted the wire rope to be inspected at speeds from 0 to 500 fpm. S.F.

N81-25411*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ZERO GRAVITY TESTING OF FLEXIBLE SOLAR ARRAYS
D. T. Chung (LMSC, Sunnyvale, Calif.) and I. E. Young *In its* The 15th Aerospace Mech. Symp. May 1981 p 115-136 refs (For primary document see N81-25403 16-39)
(Contract NAS8-31352)
Avail: NTIS HC A19/MF A01 CSCL 20K

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N81-25400* National Aeronautics and Space Administration. Pasadena Office, Calif.
PHOTOMECHANICAL TRANSDUCER Patent
Robert F. Fedors (JPL, California Inst. of Tech., Pasadena) and Mohammad N. Sarbolouki, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 24 Feb. 1981 6 p Filed 15 Dec. 1978 Supersedes N79-14908 (17 - 05, p 0671) Sponsored by NASA
(NASA-Case-NPO-14363-1; US-Patent-4,252,440; US-Patent-Appl-SN-969760; US-Patent-Class-356-216; US-Patent-Class-356-213; US-Patent-Class-356-234; US-Patent-Class-356-32) Avail: US Patent and Trademark Office CSCL 20K

Light absorbing ultra-thin films mounted under a fixed strain exhibit the behavior of an optomechanicalor photomechanical transducer. The transducer responds to light in a quick and reversible manner converting a time-variable light source into a time-variable mechanical stress easily monitored by a device such as a strain gage.
Official Gazette of the U.S. Patent and Trademark Office

N81-25401 *Stanford Univ., Calif.*
STATIC AND DYNAMIC ANALYSIS OF PLANE AND SPACE FRAMES WITH AXIAL CONSTRAINTS Ph.D. Thesis
Moshe Eisenberger 1981 193 p
Avail: Univ. Microfilms Order No. 8108921

For static analysis, a reduced set of equilibrium equations was obtained that involves only the independent joint translation and the axial forces in the constrained members. It is possible to solve directly for translations from a subset of the equations. Substitution of these values into the remaining equations produce the constraint forces. Using appropriate back-substitutions, the dependent translations and the joint rotations were found. Internal actions (other than axial forces) for each member are then calculated using standard procedures of the stiffness method. For dynamic analysis, a reduced set of equations of motion was obtained that include inertial forces corresponding to the independent joint translations. These equations are solved for the dynamic response of the independent translations due to various excitations, using the normal-mode method of analysis. Calculation of other quantities proceeds as for static analysis. Computer programs were developed for the static and dynamic analyses of plane and space frames. Dissert. Abstr.

N81-25402 *Illinois Univ. at Urbana-Champaign.*
EXPERIMENT TO STUDY EARTHQUAKE RESPONSE OF R/C STRUCTURES WITH STIFFNESS INTERRUPTIONS *Ph.D. Thesis*
Jack Peter Moehle 1980 435 p
Avail: Univ. Microfilms Order No. 8108608

The earthquake response of reinforced concrete structures having abrupt interruptions in the lateral-force-resisting elements in adjacent stories is studied. Earthquake simulation tests of four small-scale, reinforced concrete structures and static tests of small-scale members and member assemblies which were representative of elements composing the test structures were performed. Comparison of conventional modal-spectral and equivalent-lateral-force design procedures are made. The use of modal-spectral analysis for obtaining estimates of response maxima is also made. Measured dynamic strength of test structures are evaluated relative to conventional limit analysis procedures using measured static strengths of constituent members. Response for a monotonic static loading is evaluated by considering inelastic behavior of members. Dissert. Abstr.

N81-25403*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE 15TH AEROSPACE MECHANISMS SYMPOSIUM
1981 432 p refs Symp. held at Huntsville, Ala., 14-15 May 1981; sponsored by Calif. Inst. of Tech. and LMSC
(NASA-CP-2184) Avail: NTIS HC A19/MF A01 CSCL 20K

Mechanism technology relevant to aeronautics and space flight is addressed. Emphasis is placed on actuators and aerospace applications for pointing systems, latches, connectors, and other mechanisms for large space structures. For individual titles, see N81-25404 through N81-25430.

N81-25404*# Rockwell International Corp., Downey, Calif. Space Transportation System Development and Production Div.
DRIVE MECHANISM FOR THE SHUTTLE ORBITER/ EXTERNAL TANK PROPELLANT DISCONNECT
E. Thomas, R. Wilders, and J. Ulanovsky *In* NASA. Marshall Space Flight Center The 15th Aerospace Mech. Symp. May 1981 p 1-18 Prepared in cooperation with Parker-Hannifin Corp., Irvine, Calif. (For primary document see N81-25403 16-39)
Avail: NTIS HC A19/MF A01 CSCL 20K

The mechanism devised to meet the design requirements for a large 0.43-m (17 in.) nominal diameter separable disconnect for the liquid hydrogen and liquid oxygen propellant lines of the shuttle vehicle at the orbiter to external tank interface is described. The disconnect must provide for shutoff of the propellant flow area by simultaneous action of two rotary flapper valves prior to orbiter/external tank structural separation. In the case of pneumatic system failure, the rotary flapper valves, are closed automatically through mechanical interlocking linkage during disconnect separation. The mechanism must meet requirements while accommodating changes in bearing clearances and linkage geometry over a wide temperature range from ambient to 20.37 K (-423 F). The mechanical design of the separable disconnect, kinematics of the drive mechanism, and the analysis and test methods used to verify proper operation and qualification for the space shuttle dynamic environments are presented.
J.M.S.

N81-25405*# Rockwell International Corp., Downey, Calif. *Space Transportation System Development and Production Div.*
SPACE SHUTTLE ORBITER RUDDER/SPEEDBRAKE ACTUATION SYSTEM
Dwight Woolhouse In NASA. *Marshall Space Flight Center* The 15th Aerospace Mech. Symp. May 1981 p 19-29 (For primary document see N81-25403 16-39)
Avail: NTIS HC A19/MF A01 CSCL 20K

A mechanical hydraulic actuation system for control of the rudder and speedbrake aerosurfaces of the space shuttle orbiter was developed to meet the strict operational requirements imposed on this flight critical function. The requirements, hardware configuration, development experience, and test program accomplished in the evolution of this system are described.
J.M.S.

N81-25406*# Ball Aerospace Systems Div., Boulder, Colo.
PAYLOAD RETENTION LATCHES FOR THE SHUTTLE *ORBITER*
Robert D. Renken and Richard P. Maxwell *In* NASA. Marshall Space Flight Center The 15th Aerospace Mech. Symp. May *1981 p 31-46 ref (For primary document see N81-25403* 16-39)
Avail: NTIS HC A19/MF A01 CSCL 20K

The latches were designed to mount payloads in the shuttle orbiter bay. Multiple retention latches attach a payload to the

sill longerons and another latch device attaches it to the keel. Requirements for each actuator are defined and drive mechanisms are described. Other design aspects discussed include: switch mechanisms, motors, gearboxes, redundancy provisions, structural materials, and lubricants. A preliminary dry lubricant test program is also reviewed and results presented. Author

N81-25407*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.

SPACE SHUTTLE SLIDEWIRE EMERGENCY EGRESS SYSTEM

Glenn B. Jeffcoat and Emile S. Stephan *In* NASA. Marshall Space Flight Center The 15th Aerospace Mech. Symp. May 1981 p 47-62 refs (For primary document see N81-25403 16-39)

Avail: NTIS HC A19/MF A01 CSCL 20K

The Slidewire Emergency Egress System is designed to provide a fast and safe egress means for the shuttle flight crew, passengers, and ground closeout crew in the event of imminent danger while the space vehicle is still on the launch pad. Egress is from the 195 ft level of the Fixed Service Structure (FSS) to a ground landing area 1200 ft away from the launch site. The slidewire design is such that the flight crew and passengers can be evacuated to a safe area within two (2) minutes with winds as high as 34 knots from any direction. Author

N81-25408*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

MULTICHANNEL CHOPPER SYSTEM FOR A TOTAL OZONE MAPPING SPECTROMETER

Arlin J. Krueger and August O. Weilbach (Helvart Associates) *In* NASA. Marshall Space Flight Center The 15th Aerospace Mech. Symp. May 1981 p 63-75 refs (For primary document see N81-25403 16-39)

Avail: NTIS HC A19/MF A01 CSCL 30K

A multichannel chopper system designed and built to stringent NASA specifications is providing an excellent performance for a total ozone mapping spectrometer (TOMS). State of the art machining technology, suitable material selection, and a unique way to hold and position the slit-plat resulted in the instrument's better than expected performance. A shutter method used for internal calibration allows compensation for the occurrence of an unlikely wavelength shift during testing, launch, or during the orbiting life of the instrument. The TOMS is part of a payload on Nimbus 7 satellite. Author

N81-25409*# American Science and Engineering, Inc., Cambridge, Mass.

A SYSTEM APPROACH TO MECHANISMS FOR A WHITE LIGHT CORONAGRAPH/X-RAY XUV TELESCOPE

Richard Mastronardi and Richard E. Cabral *In* NASA. Marshall Space Flight Center The 15th Aerospace Mech. Symp. May 1981 p 77-90 (For primary document see N81-25403 16-39) (Grant NSF ATM-77-23757)

Avail: NTIS HC A19/MF A01 CSCL 20K

An instrument package containing nine mechanisms designed and developed for the International Solar Polar Mission is considered. This complement of instruments, commonly called the CXX, consists of a White Light Coronograph mounted parallel to a combined X-ray and Extreme Ultraviolet Telescope. Unique requirements imposed on the CXX in general and the mechanisms in particular by the nature of the mission and the anticipated spacecraft environments are discussed. It is demonstrated through example, that by considering the system as a whole, a complex instrument with nine separate mechanisms can be designed and fabricated satisfying demanding constraints. A system approach and a matrix of mechanism requirements are used to minimize the number of types of motors and pyrotechnics needed to achieve the objectives of all nine mechanisms. The result is a lightweight, low power tightly packaged complement of high reliability mechanisms. J.M.S.

N81-25410*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

COALIGNMENT OF SPACECRAFT EXPERIMENTS

Robert E. Federline *In* NASA. Marshall Space Flight Center The 15th Aerospace Mech. Symp. May 1981 p 91-113 (For primary document see N81-25403 16-39)

Avail: NTIS HC A19/MF A01 CSCL 20K

On February 14, 1980, the Solar Maximum Mission, SMM, satellite was launched into orbit with experiments to monitor solar activity. To obtain common object observations experiments must be coaligned within 90 arc seconds of the spacecraft pointing vector. Hardware was designed to minimize structural and thermal distrotions of the experiment support plate. Coalignment was provided through control of a unique interface which combined flexible blades to limit load transfer and spherical seats for alignment reference. The hardware used to achieve coalignment is described and the techniques utilized to achieve the coalignment of experiments on SMM are identified. J.M.S.

N81-25411*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

ZERO GRAVITY TESTING OF FLEXIBLE SOLAR ARRAYS c38

D. T. Chung (LMSC, Sunnyvale, Calif.) and I. E. Young *In its* The 15th Aerospace Mech. Symp. May 1981 p 115-136 refs (For primary document see N81-25403 16-39) (Contract NAS8-31352)

Avail: NTIS HC A19/MF A01 CSCL 20K

In order to develop the solar array design for solar electric propulsion and prove the feasibility for extension and retraction in space, a series of zero-g flights in a KC-135 aircraft were conducted. Six full size panels (36.83 cm. x 398.78 cm. each) and 12 half size panels were extended and retracted in the zero g provided by the KC-135. A test structure was specifically designed and built for zero g flight testing and is easily modified, depending upon the test specimen configuration. It mounts directly to the aircraft floor, with the specimen contained to survive ground handling and flight loads. The test structure is fully automatic for extension and retraction; however, there is a manual override to continue testing in the event of a power loss to the drive motors. The flexible solar array test specimen (6 panels or 12 panels) was successfully extended and retracted numerous times in the KC-135 aircraft within the zero g period of flight. Five flights successfully conducted with blanket specimens containing various panel stiffening patterns, standard cell simulation, thin cell modules, low cost cell modules, and reflectors. J.M.S.

N81-25412*# Martin Marietta Corp., Denver, Colo.

SPACE-DEPLOYABLE BOX TRUSS STRUCTURE DESIGN

John V. Coyner, Jr. and William H. Tobey *In* NASA. Marshall Space Flight Center The 15th Aerospace Mech. Symp. May 1981 p 137-146 (For primary document see N81-25403 16-39)

Avail: NTIS HC A19/MF A01 CSCL 20K

The development status of deployable box truss structure is summarized. Potential applications for this structural system are described briefly. Structural and component design requirements derived from these applications are discussed. Components of prototype 4.6 m cubes which incorporate graphite/epoxy structural members, fittings, and mechanisms are described. The benefits of the component designs and their respective manufacturing processes are presented. J.M.S.

N81-25413*# Lockheed Missiles and Space Co., Sunnyvale, Calif.

ON THE DESIGN OF LARGE SPACE DEPLOYABLE MODULAR ANTENNA REFLECTORS

J. W. Ribble and A. A. Woods, Jr. *In* NASA. Marshall Space Flight Center The 15th Aerospace Mech. Symp. May 1981 p 147-157 ref (For primary document see N81-25403 16-39) (Contract NAS1-14887)

Avail: NTIS HC A19/MF A01 CSCL 20K

Technology to assemble, erect, or deploy large reflector surfaces in space is addressed. One concept, potentially applicable to the construction of reflectors up to several hundred meters in diameter consists of individual deployable modules which are assembled in orbit into the final structural configuration. When designed for transport to orbit by the STS Orbiter, each module can be showed in a package 25 cm in diameter by 17 m long, resulting in a deployable hexagonal measuring 28 m across the corners. The initial study summarized has indicated that this deployable modular approach will support erection of 400 m reflector apertures for operation up to 2 GHz with a single space shuttle flight. Multiple launches can allow increased aperture

sizes up to the limit of efficiency dictated by the use and maturity of full space erection or space fabrication techniques. J.M.S.

N81-25414*# Lockheed Missiles and Space Co., Sunnyvale, Calif.

***THE TECHNOLOGY DEVELOPMENT METHODOLOGY FOR* A CLASS OF LARGE DIAMETER SPACEBORNE DEPLOYABLE ANTENNAS**

William D. Wade and Verdinal C. McKean *In* NASA. Marshall Space Flight Center The 15th Aerospace Mech. Symp. May 1981 p 159-172 *refs* (For primary document see N81-25403 16-39)

Avail: NTIS HC A19/MF A01 CSCL 20K

Applications identified for large diameter deployable antennas include radiometer measurements of soil moisture content for better water shed control, an electronic mail system, two-way *voice radio telephone service, emergency land mobile satellite* communications, vehicle fleet dispatch, utility power monitoring and satellite to earth microwave power transmission. The designs *and hardware development for the predecessor to such antennas* are considered. The development of a 55-meter diameter (.64-acre) offset wrap-rib reflector antenna, for demonstration *and evaluation of a full scale 100-meter diameter (2.1-acre),* intended for operational usage of S-band frequencies, is summarized. The application of thermally stable graphite/epoxy *materials in flexure is discussed and deployment mechanism* designs that are adaptable to both the proof of concept and the full scale 100 meter system with no modification to the basic *concept are presented. The ground deployment test techniques* and mechanisms developed for ground demonstration and evaluation of large size antenna structures are presented to illustrate the complexities involved in supporting antenna structural elements in excess of 25 meters in length. J.M.S.

N81-25415*# Lockheed-Georgia Co., Marietta.

HIGH FREQUENCY DRIVE MECHANISM FOR AN ACTIVE *CONTROLS SYSTEMS AIRCRAFT CONTROL SURFACE*

Hugh E. Smith *In* NASA. Marshall Space Flight Center The 15th Aerospace Mech. Symp. May 1981 p 173-188 (For primary document see N81-25403 16-39)

Avail: NTIS HC A19/MF A01 CSCL 20K

An innovative mechanism developed to accomplish the control *actuations in the presence of the many severe constraints imposed* on a wind tunnel model by the tunnel installations environment is described. The mechanism developed includes several interrelated mechanical subsystems: a low inertia, antibacklash drive mechanism conversion of rotary motion to linear motion. J.M.S.

N81-25416*# Teldix Luftfahrt-Ausruestungs G.m.b.H., Heidelberg (West Germany).

A BAPTA EMPLOYING ROTARY TRANSFORMERS, STEPPER MOTORS AND CERAMIC BALL BEARINGS

W. Auer *In* NASA. Marshall Space Flight Center The 15th Aerospace Mech. Symp. May 1981 p 189-203 *refs* (For primary document see N81-25403 16-39)

Avail: NTIS HC A19/MF A01 CSCL 20K

The utilization of rotary transformers as an alternative to slip rings for the power transfer from solar panels to a satellite's main body are shown to be advantageous, especially if an ac bus system is taken into consideration. Different approaches with main emphasis on the electro-magnetic design were investigated and showed efficiencies of up to 99% with a 3 kW power capability. A solidly preloaded pair of ball bearings with ceramic balls assures proper transformer air gaps and acceptable torque changes over temperature and temperature gradients. The bearing and power transfer assembly is driven by a direct drive stepper motor with inherent redundancy properties and needs no caging mechanism. J.M.S.

N81-25417*# British Aerospace Dynamics Group, Bristol (England). Dynamics Group.

A MECHANICAL DRIVE FOR RETRACTABLE TELESCOPIC MASTS

M. E. Humphries *In* NASA. Marshall Space Flight Center The 15th Aerospace Mech. Symp. May 1981 p 205-217 (For primary document see N81-25403 16-39)

Avail: NTIS HC A19/MF A01 CSCL 20K

Light weight extendable structures to deploy and support flexible solar arrays are described. The structure is a telescopic mast deployed by compressed gas. This provides a simple and *lightweight solution for mission applications requiring a single* operational deployment, but is not inherently well adapted to missions requiring mast retraction. To meet the need for multiple *operation cycles, an alternative mechanical drive system was* developed which has the capability for mast retraction. The manner in which the mechanism design evolved to the present develop*ment model status is described.* J.M.S.

N81-25418*# Sener, S.A., Madrid (Spain). Dept. Aerospacial.

DESIGN AND DEVELOPMENT OF AN OPTICAL SCANNING *MECHANISM (OSMA) WITH MINIMUM MOMENTUM* TRANSFER

Leandro B. FernandezSainz, Erardo Herrera, Jose M. Bajo, and *Harry J. Mallard In* NASA. *Marshall Space Flight Center* The 15th Aerospace Mech. Symp. May 1981 p 219-234 (For primary document see N81-25403 16-39)

Avail: *NTIS HC A19/MF A01 CSCL 20K*

The development model for an optical scanning mechanism assembly is described as being two equal inertial masses which *collide with each other to minimize the momentum transfer to* the satellite and other mounted instruments. The design criteria for the mirror, the compensating inertia, and other components *are given. The details of the design are discussed and related* test results which show the validity of the design concept for momentum compensating are presented. J.M.S.

N81-25419*# Societe Nationale Industrielle Aerospatiale, Cannes (France).

SOFA: AN ANTENNA FINE POINTING MECHANISM

Bernard Hubert and Pierre Brunet *In* NASA. Marshall Space Flight Center The 15th Aerospace Mech. Symp. May 1981 p 235-252 (For primary document see N81-25403 16-39)

Avail: NTIS HC A19/MF A01 CSCL 20K

A device (SOFA) designed for the highly accurate, two-axis pointing of an antenna or any feature installed on a spacecraft is described. The SOFA system, is particularly suited to the *transmit-and-receive antennas of television satellites.* It is one of the requisites for a radio-frequency type deviation detector. The major characteristics of this system are complete freedom *from friction and wear out, resulting in numerous advantages,* such as outstanding precision, virtually endless service life, high simplicity, and reliability. The sizing method is described and *performances are analyzed. The results from analog simulations* are presented. A functional model of the electrical and mechanical parts was built and subjected to on-ground tests using a two-axis platform simulating the spacecraft's motions. Various possible applications of the SOFA system are mentioned. J.M.S.

N81-25420*# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).

AN ANTENNA POINTING MECHANISM FOR LARGE REFLECTOR ANTENNAS

Hans Heimerdinger *In* NASA. Marshall Space Flight Center The 15th Aerospace Mech. Symp. May 1981 p 253-261 Sponsored by DFVLR (For primary document see N81-25403 16-39)

Avail: NTIS HC A19/MF A01 CSCL 20K

An antenna pointing mechanism for large reflector antennas on direct broadcasting communication satellites was built and tested. After listing the requirements and constraints for this equipment the model is described, and performance figures are given. Furthermore, results of the qualification level tests, including functional, vibrational, thermovacuum, and accelerated life tests are reported. These tests were completed successfully. Author

N81-25421*# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).

A DRIVE UNIT FOR THE INSTRUMENT POINTING SYSTEM

R. Birner and M. Roth *In* NASA. Marshall Space Flight Center The 15th Aerospace Mech. Symp. May 1981 p 263-278 (For primary document see N81-25403 16-39)

Avail: NTIS HC A19/MF A01 CSCL 20K

The requirements, capabilities and unique design features of the instrument pointing system Drive Units (DU) are presented.

The DU's are identical for all three gimbal axes (elevation, cross elevation, and azimuth) and provide alternating rotation of shaft versus the housing of + or - 180 degrees. The design features include: (1) two ball bearing cartridges using cemented carbide balls coated with TiC, layer; (2) redundant brushless torque motors and resolvers; (3) a load by-pass mechanism driven by a dc torque motor to off-load the bearings during ascent/descent, ground transportation, and to provide an emergency braking capability; and (4) cabling over each gimbal axis by means of cable follow-up consisting of 13 signal and 15 power flat band cable loops. The qualification of the DU is in progress. Test results of disturbance torque characteristics are presented.

Author

N81-25422*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.

SRB DEWATERING SET

Robert E. Wickham *In* NASA. Marshall Space Flight Center The 15th Aerospace Mech. Symp. May 1981 p 279-289 refs Prepared in cooperation with Naval Ocean Systems Center (For primary document see N81-25403 16-39)

Avail: NTIS HC A19/MF A01 CSCL 20K

The Solid Rocker Booster (SRB) Dewatering Set, a system that is designed to prepare the space shuttle SRB's (two per shuttle flight) for towing back to port, is discussed. The towing is the first step in recovering and refurbishing the SRB's for reuse on subsequent shuttle missions. All aspects of the SRB dewatering set were tested and found satisfactory. A full size SRB simulator, the ocean test fixture, verified that the SRB can successfully accomplish its function. E.A.K.

N81-25423*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

SPACE SHUTTLE MAIN ENGINE-HYDRAULIC ACTUATION SYSTEM

Gerhard Geller and Carl D. Lamb *In its* The 15th Aerospace Mech. Symp. May 1981 p 291-301 (For primary document see N81-25403 16-39)

Avail: NTIS HC A19/MF A01 CSCL 20K

The hydraulic actuation system's accuracy and reliability, which is necessary to control the combustion process of the hot firing space shuttle main engine was tested. The system consists of five electrohydraulic actuators and a single engine filter to control the five different propellant valves which control thrust and mixture ration of the Space Shuttle main engine. The development phase of the hydraulic actuation system with its unusual design features, built to severe requirements, is reported. E.A.K.

N81-25424*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

DEVELOPMENT OF A WINDOW PROTECTION ASSEMBLY FOR A SHUTTLE EXPERIMENT

Obie H. Bradley, Jr. *In* NASA. Marshall Space Flight Center The 15th Aerospace Mech. Symp. May 1981 p 303-329 (For primary document see N81-25403 16-39)

Avail: NTIS HC A19/MF A01 CSCL 20K

A window environmental protection assembly was developed for the Shuttle Infrared Leeside Temperature Sensing (SILTS) experiment. The assembly consists of a carbon phenolic composite window mount which contains two silicon windows, a fibrous environmental protection plug to protect the windows during launch operations and ascent heating, a release mechanism used to jettison the plug just prior to atmospheric entry, and two pin puller mechanisms which retain the plug. The plug is released from the window mount assemblies using pneumatic pin pullers and separation springs in the release mechanism. The assembly was designed and tested for severe mechanical and thermal environments experienced at the top of the shuttle orbiter vertical stabilizer during the ascent, on-orbit, and entry periods of the shuttle trajectory. E.A.K.

N81-25425*# Lockheed Missiles and Space Co., Sunnyvale, Calif.

LATCH MECHANISM FOR THE SPACE TELESCOPE

Hubert F. Schmidt *In* NASA. Marshall Space Flight Center The 15th Aerospace Mech. Symp. May 1981 p 331-339 ref (For primary document see N81-25403 16-39)

(Contract NAS8-32697)

Avail: NTIS HC A19/MF A01 CSCL 20K

Latch requirements, unique design features, analysis, and testing for the Space Telescope were developed. The space telescope is designed for launch in the space shuttle for on-orbit maintenance and Earth return capability. A manual override of any space telescope mechanism is a requirement and the forces required to override must not exceed the astronauts' capability. Earth return requires relatching or securing the Space Telescope deployables. Thermal gradients could cause unacceptable conditions, especially when trying to secure lengthy components. The latch mechanisms are mechnical preloading devices composed of a four-bar linkage driven by an electromechanical rotary actuator. E.A.K.

N81-25426*# General Electric Co., Cincinnati, Ohio. Space Div.

A FULLY REDUNDANT POWER HINGE FOR LANDSAT-D APPENDAGES

Frank E. Mamrol and Donald N. Matteo *In* NASA. Marshall Space Flight Center The 15th Aerospace Mech. Symp. May 1981 p 341-355 (For primary document see N81-25403 16-39)

Avail: NTIS HC A19/MF A01 CSCL 20K

The configuration and testing of a power driven hinge which is fully mechanically and electrically redundant and can sustain a single point failure of any one motor, speed reducer, or bearing set without loss of its ability for function is described. Because of the universality of the basic hinge design, the same hinge is used at three different locations on the LANDSAT-D spacecraft. Both the inboard and outboard hinges for the Tracking and Data Relay Satellites (TDRSS) communications antenna boom as the root hinge for the solar array. A high bending stiffness of the deployed hinge is required. The design utilizes the capability of the stepper motor drive to remove the flexibility of the drive train from the joint stiffness equation when the hinge is loaded against its stop. The stepper motor drive precludes gapping of the joint under spacecraft maneuver loads even in the absence of a latching feature. E.A.K.

N81-25427*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

COMPARATIVE EVALUATION OF OPERABILITY OF LARGE SPACE STRUCTURE CONNECTORS

Jack Stokes *In its* The 15th Aerospace Mech. Symp. May 1981 p 357-374 (For primary document see N81-25403 16-39)

Avail: NTIS HC A19/MF A01 CSCL 20K

Several connector concepts obtained from the Neutral Buoyancy Simulator, as part of the ongoing evaluation of the assembly of large space structures are discussed. Evaluation of the connectors was limited to operability during structure assembly. Parameters for examining the fasteners include subject comments and hardware damage. Assessment results include a rank ordering of the candidates with descriptions of the acceptable and unacceptable points of each. General design recommendations as a result of neutral buoyancy testing are defined. E.A.K.

N81-25428*# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).

A CLAMP MECHANISM FOR DEPLOYABLE THREE-TON PAYLOADS

R. Birner and H. Ral *In* NASA. Marshall Space Flight Center The 15th Aerospace Mech. Symp. May 1981 p 375-390 (For primary document see N81-25403 16-39)

Avail: NTIS HC A19/MF A01 CSCL 20K

The requirements, capabilities, and unique design features of the instrument pointing system IPS Payload Clamp Assembly (PCA) are presented. The PCA is designed to have the flexibility to accommodate a wide payload range varying from 0.5 m to 3 m in diameter and from 500 kg to 3000 kg mass. This is achieved by modular clamp design connected with replaceable struts. The design includes clamping of payload in a statically determined way and actuation of clamp latches by means of single linear actuator via ropes. The vibration and TV environmental conditions for the mechanism are extremely severe. A structural and prototype model has been built. Test results of the operating characteristics are presented. E.A.K.

N81-25429*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACECRAFT AUTOMATIC UMBILICAL SYSTEM
R. W. Goldin, G. G. Jacquemin, and W. H. Johnson *In its* The 15th Aerospace Mech. Symp. May 1981 p 391-421 Prepared in cooperation with LMSC, Sunnyvale, Calif. (For primary document see N81-25403 16-39)
Avail: NTIS HC A19/MF A01 CSCL 20K

The umbilical system was built to determine the suitability of the threading characteristics of the ram mechanism and to verify freedom from cross threading. It will also be used to measure connector insertion loads. It was found that: (1) berthing systems which utilize the RMS can be simplified by using RMS targets, closed circuit TV cameras, tie into the RMS control system, and grapple fixture and end effector-like capture and secure mechanisms; (2) to effect a remotely controlled umbilical interconnect in proximity with a manned spacecraft and to provide for EVA backup and Orbiter replacement unit (ORU) maintenance capabilities, 18 different mechanisms are necessary; (3) the weight impact of providing for ORU capability in a large multiple connector umbilical system was in the order of plus 60%. E.A.K.

N81-25430*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE LONG DURATION EXPOSURE FACILITY STRUCTURAL INTERFACE
Moses J. Long *In* NASA. Marshall Space Flight Center The 15th Aerospace Mech. Symp. May 1981 p 423-439 (For primary document see N81-25403 16-39)
Avail: NTIS HC A19/MF A01 CSCL 20K

The Long Duration Exposure Facility (LDEF), one of the first large structures specifically designed for insertion into orbital free flight with later retrieval and return to Earth by the Space Transportation System (shuttle) is discussed. Thermal gradients and manufacturing tolerances restrict the number of retention points in the shuttle to four with no more than three in one plane. Loads during the powered exit, high drag reentry, and landing are also critical factors in the location of retention points. It was found that the LDEF design meets all requirements while avoiding the structural weight penalties associated with an asymmetrical arrangement. E.A.K.

N81-25431*# Boeing Engineering and Construction, Seattle, Wash. Energy and Environment Div.
WIND LOADS ON FLAT PLATE PHOTOVOLTAIC ARRAY FIELDS Final Report
Ronald D. Miller and Donald K. Zimmerman Apr. 1981 384 p refs Sponsored by NASA and DOE Prepared for JPL (Contract JPL-954833)
(NASA-CR-164454; DOE/JPL-954833-81/3) Avail: NTIS HC A17/MF A01 CSCL 20K

The results of an experimental analysis (boundary layer wind tunnel test) of the aerodynamic forces resulting from winds acting on flat plate photovoltaic arrays are presented. Local pressure coefficient distributions and normal force coefficients on the arrays are shown and compared to theoretical results. Parameters that were varied when determining the aerodynamic forces included tilt angle, array separation, ground clearance, protective wind barriers, and the effect of the wind velocity profile. Recommended design wind forces and pressures are presented, which envelop the test results for winds perpendicular to the array's longitudinal axis. This wind direction produces the maximum wind loads on the arrays except at the array edge where oblique winds produce larger edge pressure loads. The arrays located at the outer boundary of an array field have a protective influence on the interior arrays of the field. A significant decrease of the array wind loads were recorded in the wind tunnel test on array panels located behind a fence and/or interior to the array field compared to the arrays on the boundary and unprotected from the wind. The magnitude of this decrease was the same whether caused by a fence or upwind arrays. Author

N81-25432*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PREDICTION OF TRANSONIC FLUTTER FOR A SUPERCRITICAL WING BY MODIFIED STRIP ANALYSIS AND COMPARISON WITH EXPERIMENT
E. Carson Yates, Jr., Eleanor C. Wynne, Moses G. Farmer, and Robert N. Desmarais May 1981 31 p refs Presented at the AIAA Dyn. Specialists Conf., Atlanta, 9-10 Apr. 1981
(NASA-TM-83126; NASA-TM-72837) Avail: NTIS HC A03/MF A01 CSCL 01C

Use of a supercritical airfoil can adversely affect wing flutter speeds in the transonic range. As adequate theories for three dimensional unsteady transonic flow are not yet available, the modified strip analysis was used to predict the transonic flutter boundary for the supercritical wing. The steady state spanwise distributions of section lift curve slope and aerodynamic center, required as input for the flutter calculations, were obtained from pressure distributions. The calculated flutter boundary is in agreement with experiment in the subsonic range. In the transonic range, a transonic bucket is calculated which closely resembles the experimental one with regard to both shape and depth, but it occurs at about 0.04 Mach number lower than the experimental one. S.F.

N81-25433*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SENSITIVITY OF OPTIMUM SOLUTIONS TO PROBLEM PARAMETERS
Jaroslaw Sobieszczanski-Sobieski, Jean-Francois Barthelemy (Virginia Polytechnic Inst.), and Kathleen M. Ryan (Kentron Intern., Inc.) May 1981 24 p refs Presented at the 22nd Struct., Struct. Dyn., and Mater. Conf., Atlanta, 6-8 Apr. 1981
(NASA-TM-83134; AIAA-Paper-81-0548) Avail: NTIS HC A02/MF A01 CSCL 20K

Derivation of the sensitivity equations that yield the sensitivity derivatives directly, which avoids the costly and inaccurate perturb-and-reoptimize approach, is discussed and solvability of the equations is examined. The equations apply to optimum solutions obtained by direct search methods as well as those generated by procedures of the sequential unconstrained minimization technique class. Applications are discussed for the use of the sensitivity derivatives in extrapolation of the optimal objective function and design variable values for incremented parameters, optimization with multiple objectives, and decomposition of large optimization problems. S.F.

N81-25434# Army Armament Research and Development Command, Watervliet, N. Y. Benet Weapons Lab.
ELASTIC-PLASTIC ANALYSIS USING A TRIANGULAR RING ELEMENT IN NASTRAN
P. C. T. Chen Nov. 1980 22 p refs Presented at the 9th NASTRAN Users Colloq., Kennedy Space Center, Fla., 21-23 Oct. 1980 Submitted for publication
(AD-A094711; AD-E440104; ARLCB-TR-80045) Avail: NTIS HC A02/MF A01 CSCL 20/11

An elastic plastic triangular ring element is implemented in the NASTRAN computer program. The plane strain problem of a partially plastic thick walled cylinder under internal pressure is solved and compared with the earlier finite difference solution. In order to demonstrate its application to more general problems, an overloaded thread problem for the British standard buttress is examined. The maximum axial and principal stresses are located and their values are determined as functions of loading. R.C.T.

N81-25435# Air Force Geophysics Lab., Hanscom AFB, Mass. Terrestrial Sciences Div.
NEAR FIELD STATIC TILT FROM SURFACE LOADS Interim Report
James F. Lewkowicz (Boston Coll.) and Gerry H. Cabaniss 8 Jul. 1980 21 p refs
(AF Proj. 2309)
(AD-A094123; AFGL-TR-80-0221; ERP-710) Avail: NTIS HC A02/MF A01 CSCL 14/2

The response of a tiltmeter to static loads produced by a vehicle was determined. The theoretical approximation of the vehicle load, by four point forces acting on a linear elastic single layer homogenous half space, was compared with the experimental data. Results indicate that this model gives a reasonable approximation of the field data. In order to model the field conditions more realistically, it is suggested that the finite element method be utilized. R.C.T.

N81-25436# Materials Research Labs., Ascot Vale (Australia).
EXPERIMENTAL DETERMINATION OF STRESS INTENSITY

IN A CRACKED CYLINDRICAL SPECIMEN
Graham Clark May 1980 21 p refs
(AD-A098336; MRL-R-774) Avail: NTIS HC A02/MF A01 CSCL 20/11

The range of stress intensity at the tip of a fatigue crack is the major factor controlling the crack growth rate, and the relationship between these two parameters for any one material is easily established from crack growth rate measurements in a specimen geometry for which the stress intensity calibration is known. However, in a different specimen geometry made from the same material, different crack growth rates will be observed, and it is possible to use this relationship to determine the stress intensity calibration for the second geometry from a comparison of crack growth rates in the two specimens. This report describes such a stress intensity calibration procedure for a hollow cylindrical specimen containing a crack which grows radially from the bore under the influence of compressive loading across a diameter of the ring. The stress intensity determined experimentally is shown to be in close agreement with the results of a theoretical study. Author (GRA)

N81-25437# Pisa Univ. (Italy). Ist. de Aeronautica.
THE FATIGUE CRACK GROWTH UNDER VARIABLE AMPLITUDE LOADING IN BUILT-UP STRUCTURES Annual Technical Report, Sep. 1978 - Oct. 1980
A. Salvetti, G. Cavallini, and L. Lazzeri Jan. 1981 83 p refs
(Grant DA-ERO-78-G-107; DA Proj. 1T1-61102-BH-57)
(AD-A098417; ATR-2) Avail: NTIS HC A05/MF A01 CSCL 01/3

Thirty-three specimens were tested both at constant and variable amplitude loading. The specimens, cut from sheets of 7075-T6 aluminium alloy, coming from the same batch were both simple sheets and riveted stiffened panels. The constant amplitude tests on simple sheet specimens were carried out in order to obtain the average K-rate relationship and the relevant scatter of the batch of sheets. The constant amplitude tests on stiffened panel were aimed at obtaining information on rivet flexibility and friction forces. Variable amplitude tests were performed utilizing the FALSTAFF spectrum. The data on sheet specimens was used to assess the reliability of prediction methods such as those devised by Wheeler and Willenborg, and the stiffened panels test data to establish how these methods work in the case of built-up structures. The results, especially those concerning the spectrum tests on stiffened panels, are still preliminary, but significant in as far as they allow us to assess the reliability of crack grow prediction methods and to obtain a qualitative but deep insight into the phenomenon of crack growth in built-up structures. GRA

N81-25438# California Univ., Livermore. Lawrence Livermore Lab.
CUMULATIVE-STRAIN-DAMAGE MODEL OF DUCTILE FRACTURE: SIMULATION AND PREDICTION OF ENGINEERING FRACTURE TESTS
M. L. Wilkins, R. D. Streit, and J. E. Reaugh (Science Applications, Inc.) 3 Oct. 1980 69 p refs
(Contract W-7405-eng-48)
(UCRL-53058) Avail: NTIS HC A04/MF A01

A cumulative strain damage criterion is used to predict the initiation and propagation of fracture in ductile materials. The model is consistent with a model of ductile rupture that involves void growth and coalescence. Two and three dimensional finite difference computer codes, which use incremental plasticity theory to describe large strains with rotation, are used to trace the history of damage in a material due to external forces. Fracture begins when the damage exceeds a critical value over a critical distance and proceeds as the critical damage state is reached elsewhere. This approach to failure prediction can be applied to an arbitrary geometry if the material behavior is adequately characterized. The damage function must be calibrated for a particular material using various material property tests. The fracture toughness of 6061-T651 aluminum is predicted. DOE

N81-25439# Bendix Corp., Kansas City, Mo. Technical Communications Dept.
FINITE-ELEMENT-METHOD STUDY OF STRESSES ON SIMULATED COMPONENTS ENCAPSULATED IN POLYSTYRENE-BEAD FOAM
G. D. Swanson Mar. 1981 23 p refs
(Contract DE-AC04-76DP-00613)
(BDX-613-2551) Avail: NTIS HC A02/MF 01

As part of an encapsulant evaluation for a high voltage electronic assembly, the linear elastic finite element method computer code SASL was used to calculate the stress distribution in an axisymmetric solder joint under load. A simulated electronic component in the form of a thumb tack was used as a physical model to calculate lead wire loads when encapsulated in 0.6 g/cu cm polystyrene bead form. The calculated lead wire loads disagreed with previous experimental data. Reanalysis of those data revealed nonlinear effects which were not adequately modeled in the SASL calculation. DOE

N81-25440# Battelle Columbus Labs., Ohio.
DEVELOPMENT OF A PLASTIC FRACTURE METHODOLOGY Final Report
M. F. Kanninen, G. T. Hahn, D. Broek, R. B. Stonesifer, C. W. Marschall, I. S. Abou-Sayed, and A. Zahoor Mar. 1981 232 p refs
(EPRI Proj. 601-1)
(EPRI-NP-1734) Avail: NTIS HC A11/MF A01

Candidate fracture criteria were investigated to determine the basis for plastic fracture mechanics assessments of nuclear pressure vessels and other components exhibiting fully ductile behavior. The research was comprised of an integrated combination of stable crack growth experiments and elastic plastic finite element analyses. The results demonstrate that many different fracture criteria can be used as the basis of a resistance curve approach to predicting stable crack growth and fracture instability. All have some disadvantages and none is completely unacceptable. On balance, the best criteria were found to be the J integral for initiation and limited amounts of stable crack growth and the local crack tip opening angle for extended amounts of stable growth. A combination of the two, which may preserve the advantages of each while reducing their disadvantages, was also suggested by these results. DOE

N81-25441# Cornell Univ., Ithaca, N. Y. Dept. of Materials Science and Engineering.
INELASTIC DEFORMATION IN CRYSTALLINE NON-METALLIC MATERIALS Progress Report
D. L. Kohlstedt Feb. 1981 49 p refs
(Contract DE-AC02-77ER-04441)
(DOE/ER-04441/4) Avail: NTIS HC A03/MF A01

Samples of much higher density than those produced by sintering were prepared by hot-pressing TiC + Ti below the solidus temperature. Hot-pressing in the system TiC-VC-Ti-V is described with emphasis on processing of (Ti,V)C samples used in creep experiments. DOE

N81-25442# California Univ., Livermore. Lawrence Livermore Lab.
DIAGNOSTIC TEST SYSTEMS CANISTER WELD JOINT ANALYSIS
M. A. Gerhard Mar. 1981 39 p
(Contract W-7405-eng-48)
(UCID-18750) Avail: NTIS HC A03/MF A01

Weld joints between the main canister channels and the canister endplates were tested. Numerical calculations were performed on this joint with the SAP4 finite element code to answer the following questions: (1) what is the gross shear stress distribution along the weld; (2) is there a large gradient in stress due to bending; (3) how do the bolts transfer the load from the canister channel through the endplates; and (4) are the bolts equally loaded. The numerical calculations showed: (1) twisting in the endplates that produced a 38-mil separation; (2) a large variation of shear stresses along the welds, varying by a factor of 4 along the upper weld; and (3) an increase in the bolt loads substantially beyond the preload. DOE

N81-25443# Minnesota Univ., Minneapolis. Dept. of Chemical Engineering and Materials Science.
MICROSTRUCTURAL APPROACH TO FATIGUE CRACK PROCESSES IN POLYCRYSTALLINE BCC MATERIALS Annual Technical Progress Report
W. W. Gerberich 1 Apr. 1981 36 p refs
(DOE/ER-10433/2; ATPR-2) Avail: NTIS HC A03/MF A01

The roles of alloy additions, grain size, and yield strength on fatigue threshold and near threshold growth rates for selected bcc materials were investigated. A predictive model for burst cleavage in Fe binary alloys was derived and verified. A predictive model for cyclic strain hardening exponents of an HSLA steel at low temperatures was also derived and verified. A proposed model for cyclic cleavage crack extension in terms of geometrically necessary dislocations was investigated. DOE

N81-25444# Washington Univ., Seattle. Dept. of Mechanical Engineering.

DYNAMIC CRACK PROPAGATION IN PIPES Interim Report

A. F. Emery, A. S. Kobayashi, and W. J. Love Mar. 1981 185 p refs

(EPRI Proj. 231-1)

(EPRI-NP-1742) Avail: NTIS HC A09/MF A01

Predictive models were developed for critical flaw sizes, for initiation and propagation of dynamic cracks in pipes and the behavior of dynamic crack propagation in double cantilever beam (DCB) specimens. Critical flaw sizes of cracks were examined by analyzing stress intensity factors under static conditions for a series of representative flaws. Fundamental properties governing rapid crack propagation and crack arrest were also studied by evaluating the fracture dynamic responses of two tapered DCB specimens. Continuing studies in the initiation and propagation of axial through cracks in pressurized pipes were conducted by using an elastic plastic finite difference shell code coupled with a one dimensional thermal hydraulic code which computed the leakage through the crack opening and the depressurization of the fluid in the pipe. A thermal hydraulic code was developed to examine the axial and circumferential pressure distributions in the vicinity of the crack tip. DOE

N81-25445# Sandia Labs., Albuquerque, N. Mex. Applied Mechanics Div.

PARAMETER ESTIMATION IN STRUCTURAL DYNAMICS MODELS

David R. Martinez Mar. 1981 305 p refs

(Contract DE-AC04-76DP-00789)

(SAND-80-0135) Avail: NTIS HC A14/MF A01

A procedure is described which is useful for structural dynamics problems limited to medium size, e.g., 1 to 200 degrees of freedom, where only a few, e.g., 1 to 10 key parameters are known. A constrained version of the discrete, iterated extended Kalman filter for parameter estimation is employed to obtain the estimates, utilizing frequency response function data as the measurements. A slight variation of modal synthesis transformation methods, including reduction of boundary coordinates, is developed to reduce the order of the original model when the frequency response function and its associated partial derivatives are needed for the estimation algorithms. The magnitude of the frequency response function /H/sub (-) (ALPHA)/(NU))/ is used as data for the estimation procedure. Development of the filter and transformation equations is described and the measurement noise characteristics for the practical case are discussed as well as the simulated data used in the numerical study. Results are given for the several cases of an example problem, demonstrating the effectiveness of the method. DOE

N81-25446# Science Applications, Inc., San Diego, Calif.

DESIGN, ASSEMBLY, AND TESTING OF X-RAY DIFFRACTION STRESS ANALYZER FOR STAINLESS STEEL PIPES Final Report

G. M. Borgonovi and D. H. Epperson Apr. 1981 57 p refs Sponsored by BMR Owners Group and EPRI

(EPRI Proj. T107-1)

(EPRI-NP-1754) Avail: NTIS HC A04/MF A01

An X-ray diffraction stress analyzer for the measurement of the longitudinal component of the residual stress in proximity of welds inside stainless steel pipes 10 in. in dia. and larger was assembled. The design of the stress analyzer is based on the use of chromium radiation from a commercial diffraction tube and on the application of the single exposure technique. The heart of the system is a scintillator based position sensitive detector. The diffracted X-rays are converted to light and transmitted to an image intensifier through flexible fiber optic bundles. After intensification, the light distribution generated by the diffracted X-ray beams is measured by photosensitive diode arrays. The signal from the arrays is digitized and analyzed by a minicomputer. DOE

N81-25447# Earthquake Engineering Research Inst., Berkeley, Calif.

INELASTIC SEISMIC ANALYSIS OF LARGE PANEL BUILDINGS

Vahid Schricker Sep. 1980 290 p refs

(Grant NSF PFR-79-08257)

(PB81-154338; UCB/EERC-80/38; NSF/RA-800198) Avail: NTIS HC A13/MF A01 CSCL 13M

A mathematical model for inelastic seismic analysis of two dimensional large panel structures is described. The wall panels are idealized either by elastic beam type elements or by two dimensional finite elements. The joints are idealized by nonlinear spring elements with a variety of possible force deformation relationships. FORTRAN subroutines for several panel and joint elements were developed and incorporated into the computer program DRAIN-2D. Using DRAIN-2D, a parameter study was carried out on a multistory single bay, large panel wall to determine the influence of design and analysis assumptions on the computer nonlinear response considering both slip and opening at the joints. GRA

N81-25448# Earthquake Engineering Research Inst., Berkeley, Calif.

INELASTIC BUCKLING OF STEEL STRUTS UNDER CYCLIC LOAD REVERSALS

R. Gary Black, W. A. Wenger, III, and Egor P. Popov Oct. 1980 172 p refs

(Grants NSF ENV-76-04263; NSF PFR-79-08984)

(PB81-154312; UCB/EERC-80/40; NSF/RA-800299) Avail: NTIS HC A08/MF A01 CSCL 13M

Cyclic axial loading experiments simulating severe seismic conditions are described for twenty-four structural steel struts of sizes and shapes typically employed as braces in small to moderately large steel buildings. Six of the twenty-four members were pinned at one end and fixed at the other, while the remaining eighteen were pinned at both ends. The range of cross sectional shapes included wide flanges, double angles, double channels, structural tees, thin and thick walled pipes, and thin and thick walled square tubes. The responses of the specimens are evaluated and special attention paid to the effects of cross sectional shape, end conditions, and slenderness ratio using hysteretic envelope. GRA

N81-25449# Earthquake Engineering Research Inst., Berkeley, Calif.

SHAKING TABLE TESTING OF A REINFORCED CONCRETE FRAME WITH BIAXIAL RESPONSE

Michael G. Oliva Oct. 1980 207 p refs

(Grant NSF PFR-79-08257)

(PB81-154304; UCB/EERC-80/28; NSF/RA-800366) Avail: NTIS HC A10/MF A01 CSCL 13M

A one third scale two-story reinforced concrete frame, having rectangular section columns, with inelastic biaxial motion induced through earthquake excitation on a shaking table was tested. Close inspection of the experimental response and comparison with previous test results on a similar frame under pure uniaxial motion, found that biaxial motion seriously reduced the column yield strength. Local and global response characteristics indicated a tremendous amount of interaction between the rectangular column's strong axis motion and weak axis response. Weak axis stiffness was reduced to less than one third the initial value, through strong axis interaction, associated with narrow hysteretic load deformation response, characteristic of a low energy absorption mechanism. GRA

N81-25450# Earthquake Engineering Research Inst., Berkeley, Calif.

EXPERIMENTAL TESTING OF AN ENERGY ABSORBING BASE ISOLATION SYSTEM

James M. Kelly, Mark S. Skinner, and Karl E. Beucke Oct. 1980 73 p refs Sponsored in part by the Malaysian Rubber Producers' Research Association

(Grant NSF PFR-79-08257)

(PB81-154072; UCB/EERC-80/35; NSF/RA-800297)

Avail: NTIS HC A04/MF A01 CSCL 13M

After the energy absorbing device had been subjected to a series of preliminary static tests designated to determine hysteretic behavior of the device, the natural rubber bearings and devices were incorporated in an 80,000 lb structural model. The model was mounted on a twenty foot square shaking table and subjected to a range of earthquake ground motion. Relative displacements at the natural rubber bearings were considerably lower with the devices installed, while structural accelerations were not increased. When both the energy absorbing device and natural rubber bearings were in place, the structural model withstood simulated earthquake ground motions of extremely high intensity. GRA

N81-25451# California Univ., Berkeley. Earthquake Engineering Research Center.

INPUT IDENTIFICATION FROM STRUCTURAL RESPONSE

Hu. Yuxian Aug. 1980 90 p refs

(Grant NSF PFR-79-08261)

(PB81-152308; UCB/EERC-80/26; NSF/RA-800295) Avail: NTIS HC A05/MF A01 CSCL 13M

The equivalent linearization method is applied to input identification from known structural response and system parameters working in frequency domain. In addition to the commonly used one-model procedure, a two-model input identification procedure is proposed. Structural response obtained from true hysteretic loop analyses are used as the known responses with the unknown input motions to be identified. These identified motions are then compared with the real motions to check agreement with their maximum accelerations, response spectra, Fourier amplitude spectra, and acceleration time-histories. GRA

N81-26012# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

A METHOD FOR MODAL IDENTIFICATION

Gabriel Coupry *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-5 (ESA-TT-673) Mar. 1981 p 51-56 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-5, Sep. - Oct. 1980 p 347-352 (For primary document see N81-26008 16-99)

Avail: NTIS HC A05/MF A01

N81-26020# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

STRUCTURAL CALCULATIONS IN VISCOPLASTICITY. COMPARISON BETWEEN FINITE ELEMENT METHODS AND BOUNDARY INTEGRAL EQUATION METHODS

M. Chaudonnert *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-6 (ESA-TT-687) Dec. 1980 p 69-75 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-6, Nov. - Dec. 1980 p 437-443 Original report in FRENCH previously announced as A81-19554 (For primary document see N81-26015 16-99)

Avail: NTIS HC A05/MF A01

42 GEOSCIENCES (GENERAL)

N81-25452*# Brown Univ., Providence, R. I. Dept. of Geological Sciences.

***STUDY ON VARIOUS ELEMENTS OF THE GEOSCIENCES WITH RESPECT TO SPACE TECHNOLOGY* Final Report**

James W. Head, III Apr. 1981 61 p Sponsored by NASA

(Contract JPL-955513)

(NASA-CR-164450) Avail: NTIS HC A04/MF A01 CSCL 08G

The utility of data acquired in space for both basic and applied studies of the geology of the Earth was evaluated. Focus was placed upon the gaps in the current ability to make effective use of remote sensing technology within the Earth sciences. A long range plan is presented for future research that involves an appropriate balance between the development and application of space techniques. T.M.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N81-25453*# Humboldt State Univ., Arcata, Calif. Dept. of Forestry.

THE APPLICATION OF LANDSAT REMOTE SENSING TECHNOLOGY TO NATURAL RESOURCES MANAGEMENT. SECTION 1: INTRODUCTION TO VICAR - IMAGE CLASSIFICATION MODULE. SECTION 2: FOREST RESOURCE ASSESSMENT OF HUMBOLDT COUNTY. Final Report, Apr. - Dec. 1980

Lawrence Fox, III, Principal Investigator and Kenneth E. Mayer Dec. 1980 39 p refs ERTS

(Grant NsG-2341)

(E81-10120; NASA-CR-164114) Avail: NTIS HC A03/MF A01 CSCL 05B

A teaching module on image classification procedures using the VICAR computer software package was developed to optimize the training benefits for users of the VICAR programs. The field test of the module is discussed. An intensive forest land inventory strategy was developed for Humboldt County. The results indicate that LANDSAT data can be computer classified to yield site specific forest resource information with high accuracy (82%). The 'Douglas-fir > 80%' category was found to cover approximately 21% of the county and 'Mixed Conifer > 80%' covering about 13%. The 'Redwood > 80%' resource category, which represented dense old growth trees as well as large second growth, comprised 4.0% of the total vegetation mosaic. Furthermore, the 'Brush' and 'Brush-Regeneration' categories were found to be a significant part of the vegetative community, with area estimates of 9.4 and 10.0%. E.D.K.

N81-25454*# Cornell Univ., Ithaca, N. Y. Remote Sensing Program.

CORNELL UNIVERSITY REMOTE SENSING PROGRAM Semiannual Status Report, 1 Jun. - 30 Nov. 1980

Ta Liang, Warren R. Philipson, Principal Investigators, and John A. Stanturf Dec. 1980 375 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS

(Grant NGL-33-010-171)

(E81-10153; NASA-CR-164267) Avail: NTIS HC A16/MF A01 CSCL 05B

High altitude, color infrared aerial photography as well as imagery from Skylab and LANDSAT were used to inventory timber and assess potential sites for industrial development in New York State. The utility of small scale remotely sensed data for monitoring clearcutting in hardwood forests was also investigated. Consultation was provided regarding the Love Canal Landfill as part of environment protection efforts. For individual titles, see N81-25455 through N81-25461.

N81-25455*# Cornell Univ., Ithaca, N. Y. Remote Sensing Program.

APPENDIX A: FUELWOOD AVAILABILITY FOR A TEN MEGAWATT POWER PLANT IN TUPPER LAKE, NEW YORK, BASED ON REMOTELY SENSED AND OTHER DATA

In its Cornell Univ. Remote Sensing Program Dec. 1980 22 p refs ERTS (For primary document see N81-25454 16-43)

Avail: NTIS HC A16/MF A01 CSCL 08F

Forested land potentially available for fuelwood harvest within 30 km of Tupper Lake, N.Y. was delineated and classified as to forest using NASA aerial photography and LANDSAT imagery. Published inventory and growth data were used to estimate woody material on the available land. The information submitted to the Energy Office indicates that there is sufficient woody material to supply a 10 MW plant. A.R.H.

N81-25456*# Cornell Univ., Ithaca, N. Y. Remote Sensing Program.

APPENDIX B: INVENTORY OF CONIFEROUS FORESTS NEAR BATH, NEW YORK

John A. Stanturf *In its* Cornell Univ. Remote Sensing Program

Dec. 1980 3 p ERTS (For primary document see N81-25454 16-43)
Avail: NTIS HC A16/MF A01 CSCL 02F

A zoom stereoscope was used to interpret aerial color photographs of the Finger Lakes region near Bath, New York, and areas of conifers were delineated on acetate sheets. Scale was determined for each photograph and units were converted to acres. Photographically enlarged positive transparencies of imagery from LANDSAT bands 5,6, and 7 for the southern portion of the study area were placed in a cold additive viewer and registered with each other to provide a composite image. A green filter was used on band 5, blue on band 6, and red on band 7. Conifers appeared at dark, reddish purple. Acreage was determined using a grid. Results show that the total confer stands within 50 miles of Bath is approximately 176,000 acres of which 60,000 acres are in Pennsylvania. The study was conducted to determine the feasibility of locating a particleboard manufacturing firm in the Southern Tier. A.R.H.

N81-25457*# Cornell Univ., Ithaca, N. Y.
APPENDIX C: A COMPARATIVE STUDY OF SMALL SCALE REMOTELY SENSED DATA FOR MONITORING CLEARCUTTING IN HARDWOOD FORESTS M.S. Thesis
William Robert Hafker *In its* Cornell Univ. Remote Sensing Program Dec. 1980 157 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N81-25454 16-43)
Avail: NTIS HC A16/MF A01 CSCL 02F

Manual photointerpretation techniques were used to analyze images acquired by high altitude aircraft, the Skylab multispectral and Earth terrain camera (ETC), the LANDSAT multispectral scanner, and the LANDSAT-3 return beam vidicon camera. A color-additive viewer, and digital image analysis were also used on the LANDSAT MSS imagery. The value of each type of remotely sensed data was judged by the ease and accuracy of clearcut identification, and by the amount of detail discernible, especially regarding revegetation. Results of a site study in the Allegheny National Forest, Pennsylvania indicate that high altitude aerial photography, especially color infrared photography acquired during the growing season, is well suited for identifying clearcuts and assessing revegetation. Although photographs acquired with Skylab's ETC also yielded good results, only incomplete inventories of clearcuts could be made using LANDSAT imagery. Results for the Adirondack region of New York State were similar for the aircraft and satellite photography, but even less satisfactory for the LANDSAT imagery. A.R.H.

N81-25458*# Cornell Univ., Ithaca, N. Y.
APPENDIX D: ASSESSEMENT OF POTENTIAL INDUSTRIAL SITES IN ESSEX COUNTY, NEW YORK
Thomas M. Wozny *In its* Cornell Univ. Remote Sensing Program Dec. 1980 138 p refs ERTS (For primary document see N81-25454 16-43)
Avail: NTIS HC A16/MF A01 CSCL 08B

Potential industrial sites were assessed using high and medium altitude aircraft photographs and supporting information on the 4,730 sq. km. (1,825 sq. mile) county. Factors evaluated include land availability, slope, site accessibility, soil drainage, other subsurface characteristics, and the expected physical as well as visual impacts on existing land use. Areas unavailable or unsuitable for development were eliminated first, and the remaining areas evaluated and the best sites identified. Author

N81-25459*# Cornell Univ., Ithaca, N. Y.
APPENDIX E: RESEARCH PAPERS. ANALYSIS OF LANDFILLS WITH HISTORIC AIRPHOTOS
Ta Liang, Warren R. Philipson, Principal Investigators, Thomas L. Erb, and William L. Teng *In its* Cornell Univ. Remote Sensing Program Dec. 1980 5 p refs Repr. from Proc. of the Specialty Conf. of the Aerospace Div. of the Am. Soc. of Civil Engr., 1980 p 15-23 Presented at the Specialty Conf. of the Aerospace Div. of the Am. Soc. of Civil Engr., Madison, Wis., 13-14 Aug. 1980 ERTS (For primary document see N81-25454 16-43)
Avail: NTIS HC A16/MF A01 CSCL 08B

The nature of landfill-related information that can be derived from existing, or historic, aerial photographs, is reviewed. This information can be used for conducting temporal assessments of landfill existence, land use and land cover, and the physical environment. As such, analysis of low cost, readily available aerial photographs can provide important, objective input to landfill inventories, assessing contamination or health hazards, planning corrective measures, planning waste collection and facilities, and developing on inactive landfills. Author

N81-25460*# Cornell Univ., Ithaca, N. Y. Remote Sensing Program.
APPENDIX E: RESEARCH PAPERS. MANUAL VERSUS DIGITAL LANDSAT ANALYSIS FOR MODELING RIVER FLOODING
Warren R. Philipson, Principal Investigator and William R. Hafker *In its* Cornell Univ. Remote Sensing Program Dec. 1980 6 p refs Repr. from Tech. Papers of the Am. Soc. of Photogrammetry Fall Tech. Meeting, 1980 Presented at the Am. Soc. of Photogrammetry Fall Tech. Meeting, Niagara Falls, N.Y., 7-10 Oct. 1980 ERTS (For primary document see N81-25454 16-43) (ISSN-0271-4040) Avail: NTIS HC A16/MF A01 CSCL 05A

The comparative value of manual versus digital image analysis for determining flood boundaries is being examined in a study of the use of LANDSAT data for modeling flooding of the Black River, in northern New York. The work is an extension of an earlier study in which Black River flooding was assessed through visually interpreted, multi-date LANDSAT band 7 images. Based on the results to date, it appears that neither color-additive viewing nor digital analysis of LANDSAT data provide improvement in accuracy over visual analysis of band 7 images, for delineating the boundaries of flood-affected areas. Author

N81-25461*# Cornell Univ., Ithaca, N. Y. Remote Sensing Program.
APPENDIX E: RESEARCH PAPERS. USE OF REMOTE SENSING IN LANDSCAPE STRATIFICATION FOR ENVIRONMENTAL IMPACT ASSESSMENT
John A. Stanturf (Heimbuch-Stanturf, Inc., Ithaca, N.Y.) and Douglas G. Heimbuch *In its* Cornell Univ. Remote Sensing Program Dec. 1980 6 p refs Repr. from Tech. Papers of the Am. of Photogrammetry Fall Tech. Meeting, 1980 Presented at the Am. Soc. of Photogrammetry Fall Tech. Meeting, Niagara Falls, N.Y., 7-10 Oct. 1980 ERTS (For primary document see N81-25454 16-43)
Avail: NTIS HC A16/MF A01 CSCL 13B

A refinement to the matrix approach to environmental impact assessment is to use landscape units in place of separate environmental elements in the analysis. Landscape units can be delineated by integrating remotely sensed data and available single-factor data. A remote sensing approach to landscape stratification is described and the conditions under which it is superior to other approaches that require single-factor maps are indicated. Flowcharts show the steps necessary to develop classification criteria, delineate units and a map legend, and use the landscape units in impact assessment. Application of the approach to assessing impacts of a transmission line in Montana is presented to illustrate the method. A.R.H.

N81-25462# Committee on Science and Technology (U. S. House).
OPERATIONAL CIVIL REMOTE SENSING SYSTEMS
Washington GPO 1980 318 p refs Hearings before the Subcomm. on Space Sci. and Appl. and Subcomm. on Nat. Resources and Environ. of the Comm. on Sci. and Technol., 96th Congr., 2nd Sess., no. 131, 24-25 Jun. and 29 Jul. 1980 (GPO-66-645) Avail: Subcommittee on Space Science and Applications

Several transition plans for moving to a fully integrated satellite-based land remote sensing program were examined. Central to establishing a plan is the need to involve the private sector and seek ways to further private sector opportunities in the operational system. Views from major private industries are presented. T.M.

N81-25463*# Operations Research, Inc., Silver Spring, Md.
MULTISPECTRAL RESOURCE SAMPLER (MRS): PROOF OF CONCEPT STUDY ON ATMOSPHERIC CORRECTIONS. DETERMINATIONS OF ATMOSPHERIC OPTICAL PARAMETERS USING THE MULTISPECTRAL RESOURCE SAMPLER

ATMOSPHERIC OPTICAL Final Report, 15 May 1979 - 15 Jan. 1980

Robert E. Turner (Science Applications, Inc.) Dec. 1979 76 p refs 5 Vol.

(Contract NAS5-25606)

(NASA-CR-166664) Avail: NTIS HC A05/MF A01 CSCL 20F

An investigation was performed to determine which mathematical algorithms should be used in the calculation of atmospheric optical parameters using the Multispectral Resource Sampler (MRS) sensor. A simulation of the MRS sensor was performed using a radiative-transfer model. The simulation provides the spectral radiance at the satellite sensor in terms of various atmospheric parameters, such as optical thickness, solar zenith angle, nadir view angle, relative azimuth angle, bi-directional reflectance of the target, background albedo, and wavelength. Atmospheric correction algorithms were also developed for the determination of the total spectral optical thickness of the atmosphere for: (1) homogeneous (horizontal) hazy atmospheres with diffuse targets; (2) inhomogeneous (horizontal) hazy atmospheres with diffuse targets; and (3) homogeneous (horizontal) hazy atmospheres with non-diffuse targets. S.F.

N81-25464*# Operations Research, Inc., Silver Spring, Md.

MULTISPECTRAL RESOURCE SAMPLER (MRS): PROOF OF CONCEPT. STUDY ON BIDIRECTIONAL REFLECTANCE. A SIMULATION ANALYSIS OF BIDIRECTIONAL REFLECTANCE PROPERTIES AND THEIR EFFECTS ON SCENE RADIANCE. IMPLICATIONS FOR THE MRS Final Report, 15 May 1979 - 15 Jan. 1980

James A. Smith (Colorado State Univ.) Jan. 1980 132 p refs 5 Vol.

(Contract NAS5-25606)

(NASA-CR-166668) Avail: NTIS HC A07/MF A01 CSCL 20F

A study was performed to evaluate the geometrical implication of a Multispectral Resource Sampler: a pointable sensor. Several vegetative targets representative of natural and agricultural canopies were considered in two wavelength bands. All combinations of Sun and view angles between 5 and 85 degrees zenith for a range of azimuths were simulated to examine geometrical dependance arising from seasonal as well as latitudinal variation. The effects of three different atmospheres corresponding to clear, medium and heavy haze conditions are included. An extensive model data base was generated to provide investigators with means for possible further study of atmospheric correction procedures and sensor design questions. S.F.

N81-25465*# Operations Research, Inc., Silver Spring, Md.

MULTISPECTRAL RESOURCE SAMPLER: PROOF OF CONCEPT. LITERATURE SURVEY OF BIDIRECTIONAL REFLECTANCE

1981 202 p refs

(Contract NAS5-25606)

(NASA-CR-166669) Avail: NTIS HC A10/MF A01 CSCL 20F

A bibliography compiled in order to give a comprehensive review of previous work in scene bidirectional reflectance, particularly those studies relevant to the Multispectral Resource Sampler (MRS) is presented. The bibliography contains 124 abstracts. In addition a synthesis of the literature results is given along with background information concerning MRS. M.G.

N81-25466# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

INFORMATION RELATIVE TO CARTOGRAPHY AND GEODESY. SERIES 2: TRANSLATIONS

1980 78 p refs Original contains color illustrations

(ISSN-0469-4244) Avail: NTIS HC A05/MF A01

A photomechanical process for producing elevations, communication theory and cartography, and a method for drawing boundaries on maps are addressed. Maps for environmental assessment, town planning maps and methods for retraining cartographers displaced by automation are also discussed. For individual titles, see N81-25467 through N81-25472.

N81-25467# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

PICTOLINE: A PHOTOCHEMICAL PROCESS FOR PREPARATION OF CARTOGRAPHIC DRAWINGS AND ITS APPLICATIONS

Erno Berger *In its* Inform. Relative to Cartography and Geodesy. Ser. 2: Transl. 1980 p 5-16 refs (For primary document see N81-25466 16-43)

Avail: NTIS HC A05/MF A01

The Pictoline process for combining a continuous tone image negative with a positive of equal density on lithographic film is explained. Use of the process for producing elevations from architectural photographs of building facades is described. Instruments, materials and sequence of operations are given. Drawings with an accuracy of + or - 1 mm (5 cm in nature at a scale of 1:50) can be produced. Limitations inherent in working from photographs can be avoided by taking aerial photographs at noon and before trees are in leaf, and by avoiding wide angle lenses and oblique illumination. Author (ESA)

N81-25468# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

CAN COMMUNICATION THEORY FORM THE BASIS OF A GENERAL THEORY OF CARTOGRAPHY?

Ulrich Freitag In its Inform. Relative to Cartography and Geodesy. Ser. 2: Transl. 1980 p 17-35 refs (For primary document see N81-25466 16-43)

Avail: NTIS HC A05/MF A01

Principles and categories of information theory and communication theory are discussed which present the process of cartographic communication as a time dependent process and multi-element system. Opposing concepts are given which expose an independent theory of the graphic or are variations of general sign theory. A synthesis of sign theory and communication theory is put forward as the basis of a general theory of cartography. Author (ESA)

N81-25469# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

CUT AND LEAVE: A SPECIAL APPLICATION OF MANUAL MASK CUTTING FOR MAP PRODUCTION

Hans-Oswald Kessler *In its* Inform. Relative to Cartography and Geodesy. Ser 2: Transl. 1980 p 37-54 ref Original contains color illustrations (For primary document see N81-25466 16-43)

Avail: NTIS HC A05/MF A01

A method for adding wide (more than 0.5 mm) boundary lines to maps is described, which makes hand drawing with ink unnecessary. High transparency self adhesive masking material is placed over the boundary tracing, in wide strips. Before cutting, the basic drawing and foil with indicated boundaries are turned over so that the glossy side of the foil is on top. Boundaries are then cut freehand, using a drawing pen with honed nibs as a cutting tool. After cutting, spare material is lifted off. The image can be transferred directly to an offset printing plate. Author (ESA)

N81-25470# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

CARTOGRAPHIC PROBLEMS WITH RESPECT TO THE UTILIZATION OF MAPS FOR ENVIRONMENTAL ASSESSMENT

Joachim Neumann In its Inform. Relative to Cartography and Geodesy. Ser. 2: Transl. 1980 p 55-59 (For primary document see N81-25466 16-43)

Avail: NTIS HC A05/MF A01

Existing maps and map series of the Federal Republic of Germany are described and their use for environment management is discussed. The advantages and disadvantages of completeness, specialization and large scale rendering are mentioned. Author (ESA)

N81-25471# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

PLANNING RESTRICTION AREA MAPS IN TOWN PLANNING

Heinz Pape In its Inform. Relative to Cartography and Geodesy. Ser. 2: Transl. 1980 p 61-67 (For primary document see

N81-25466 16-43)
Avail: NTIS HC A05/MF A01

The use of special map series to portray restrictions which limit the availability of land for urban planning and development is discussed. Restriction area maps make visible many factors with regard to their types, spatial emissions, and assignments and form a pertinent series of analytical maps from which other maps can be derived showing complex information by means of combination and synthesis, e.g., by assembling. Examples of noise maps, sulfur dioxide maps, and dust maps are given.
Author (ESA)

N81-25472# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
COMPUTER-ASSISTED CARTOGRAPHY: PSYCHOLOGICAL BARRIERS
Helmut Uhrig *In its* Inform. Relative to Cartography and Geodesy. *Ser. 2: Transl. 1980* p 69-78 refs (For primary document see N81-25466 16-43)
Avail: NTIS HC A05/MF A01

Management techniques for encouraging cartographic personnel to accept retraining in computer techniques are discussed. Lack of motivation, fear of failure and age as barriers are treated. Emphasis on the similarities between manual and computer assisted techniques is put forward as a means of introducing the employee to automation, using the example of digitizing versus scribing. The drawbacks in present computer courses are listed.
Author (ESA)

N81-25473# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
SOIL MOISTURE AND AGROMET MODELS
Marvin A. Cochrane, Jr. Mar. 1981 36 p refs Supersedes USAFETAC/TN-77/3
(AD-A097048; USAFETAC/TN-81-001; USAFETAC/TN-77/3)
Avail: NTIS HC A03/MF A01 CSCL 04/2

The two models are used operationally to monitor crop growing conditions. The Soil Moisture model uses Thornthwaite's water balance method to estimate moisture parameters from daily temperature and precipitation analysis. The more complex Agromet model estimates daily evaporation potential using Penman's equation. This model also uses a complex cloud analysis to estimate radiation effects. Agromet provides daily grid-point analyses of temperature, precipitation, snow depth, radiation, and evaporation.
T.M.

N81-25474# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
ON THE RELATION BETWEEN THE ICE TRANSPORT IN THE EAST GREENLAND CURRENT AND THE ATMOSPHERIC CIRCULATION OVER THE ARCTIC OCEAN
Klaus Struebing Nov. 1980 13 p ref Transl. into ENGLISH from Dtsch. Hydrogr. Z.(W. Germany), v. 20, no. 6, 1967 9 p Presented at the Conv. of Meteorol. and Geophysicists, Hamburg, 2 Apr. 1968
(AD-A094635; CRREL-TL-752) Avail: NTIS HC A02/MF A01 CSCL 08/12

The ice conditions in the East Greenland Current are described by the mean expansion of the ice belt between 65 N and 70 N during the months of April through August. Compared with the long term mean, the years 1949-52 proved to be rich in ice, the years 1957-58 poor in ice. The pattern of the atmospheric circulation over the Arctic Ocean was derived from differences in the atmospheric pressure between the terminal points of the following two profiles: profile A; on the 180th meridian between 85 N and 75 N; and profile B; on 80 E between North Pole and 90 N.
S.F.

N81-25475# Glowny Inst. Gornictwa, Katowice (Poland).
GEOPHYSICAL METHODS FOR COAL SEAM VARIABILITY DETECTION IN FRONT OF MINING FACE
Roman Zakolski Jul. 1980 29 p refs Sponsored by the *Maria Sklodowska-Curie Joint Fund*
(DOE/TIC-11444; Rept-1) Avail: NTIS HC A03/MF A01

Problems in detecting geologic faults or washouts in coal seams by the use of seismic waves are considered. For transmission, the shot point should not be greater than 500 m from the detection point. A minimum thickness of the seam for transmission is equivalent to the lower limit of thickness for mining. The interpretation of the results is more difficult for thick seams (25 m) and the resolution is lower. The throw of a fault should be equal to the seam thickness or greater; throws of half the thickness can be detected only in favorable conditions; and the fault must not be parallel to the propagation.
DOE

N81-25476# Alaska Univ., Fairbanks. Geophysical Inst.
REVIEW OF TECHNOLOGY FOR ARCTIC OFFSHORE OIL AND GAS RECOVERY
W. M. Sackinger Aug. 1980 105 p refs
(Contract DE-AC01-80ET-14317)
(DOE/ET-14317/T2-Vol-1) Avail: NTIS HC A06/MF A01

A five year leasing schedule for the ice-prone waters of the Arctic offshore is presented, which also shows the projected dates of the lease sale for each area. The estimated peak production rates for these areas are given. There is considerable uncertainty for all these production estimates, since no exploratory drilling has yet taken place. A flow chart is presented which relates the special Arctic factors, such as ice and permafrost, to the normal petroleum production sequence.
DOE

N81-25477# ICF, Inc., Washington, D. C.
COAL RESOURCE INFORMATION, VOLUME 2, PART 3: BIBLIOGRAPHY Final Report
J. M. Eyster, D. E. Klein, and D. R. Walton Dec. 1980 493 p refs 2 Vol.
(EPRI Proj. 868-1)
(EPRI-EA-673-Vol-2-Pt-3) Avail: NTIS HC A21/MF A01

A bibliography is presented of over 4300 coal resource documents published through 1976 and early 1977 regarding the location, quality, and mineability of US coal. Materials consist of documents, reports, articles, and maps; the listings are cross indexed by state, county, and geographic designations; and a bibliography of bibliographies is included.
DOE

N81-25478# ICF, Inc., Washington, D. C.
COAL RESOURCE INFORMATION. VOLUME 2, PART 2: **ANNOTATION OF SELECTED SOURCES Final Report**
J. M. Eyster, D. E. Klein, and D. R. Walton Dec. 1980 532 p refs 2 Vol.
(EPRI Proj. 868-1)
(EPRI-EA-673-Vol-2-Pt-2) Avail: NTIS HC A23/MF A01

The documents were chosen to ensure representation of all 37 coal bearing states. Documents selected for annotation were those with more recent information about the quantity and quality of coal reserved, as well as those that provided data on wide geographical areas. The annotations were selected and written in late 1977 and early 1978. An annotation form was developed to provide a consistent presentation and through review of the information contained in each source. The form is organized into four categories: the data base, the geologic and physiographic parameters, coal characterization parameters, and map data sources.
DOE

N81-25479# Delaware Geological Survey, Newark.
PRELIMINARY TARGETING OF GEOTHERMAL RESOURCES IN DELAWARE *Progress Report, 15 Jul. 1979 - 30 May 1980*
Kenneth D. Woodruff Aug. 1980 24 p
(Contract DE-AS02-78ET-28416; ET-78-S-02-4715)
(DOE/ET-28416/2) Avail: NTIS HC A02/MF A01

Work completed included additional gravity mapping in southern Delaware, development of a computer program for contouring gravity data, and some preliminary quantitative interpretations of gravity and magnetic data in southern Delaware. No significant changes were made in the original Bouguer gravity map produced during the original contract period as a result of this later mapping. The SYMAP and SCONTOUR computing programs, developed by Harvard Graphics and adapted for the B7700, were used to generate computer drawn Bouguer gravity maps for the study area. Maximum depths calculated for the top of a gravity anomaly in the Bridgeville area ranged from about 2.3 to 2.7 kilometers (7500 to 8000 feet). Depth to magnetic basement in the same general area was calculated to be between about 1.5 and 2.9 kilometers (4920 and 6200 feet). Both gravity and magnetic data agree with trends noted on regional maps and suggest that in selected cases fracture zones

beneath the coastal plain might be a possible target for future geothermal exploration. A.R.H.

N81-25480# Nebraska Univ. - Lincoln. Center for Agricultural Meteorology and Climatology.
***REMOTELY SENSED CROP TEMPERATURE FOR WATER RESOURCES MANAGEMENT* Project Completion Report, 1 Oct. 1977 - 30 Sep. 1980**
Bronson R. Gardner, Kirk L. Clawson, Norman J. Rosenberg, Darrell G. Watts, and Roberto E. Maurer Nov. 1980 207 p refs
(Contract DI-14-34-0001-8097)
(PB81-147795; W81-01002; OWRT-B-044-NEB(2)) Avail: NTIS HC A12/MF A01 CSCL 02C

The overall goal of the project was to evaluate the use of the crop temperature data as a tool in the management of *water resources. The specific objectives of the study were: (1) to* determine the crop temperature response of some major agronomic crops to various levels of water stresses; (2) to test *methods based on crop temperature or other remotely sensed* data to estimate crop water stress conditions and to evaluate the utility of these methods for their ability to estimate crop *yields, severity of water stress and crop phenological development;* and (3) to determine the feasibility of using crop temperature as a guide for irrigation scheduling. GRA

N81-25481# Wyoming Univ., Laramie. Water Resources Research Inst.
WATER MOVEMENT THROUGH STANDS OF LODGEPOLE PINE FOREST IN WYOMING
Dennis H. Knight and Timothy J. Fahey Nov. 1980 82 p refs
(Contract DI-14-34-0001-7202)
(PB81-152027; W81-01175; OWRT-B-036-WYO(1)) Avail: NTIS HC A05/MF A01 CSCL 02F

Contents: Transpiration from 100 yr-old Lodgepole Pine forests estimated with whole-tree photometers; The effect of night frost on the transpiration of Pnius contorta sp. latifolia; The relative effect of stand structure, soil and certain environmental factors on water outflow from Pinus contorta forest. GRA

N81-25482# *Tennessee Valley Authority, Muscle Shoals, Ala.* Office of Natural Resources.
REMOTE SENSING OF SULFUR DIOXIDE EFFECTS ON VEGETATION: SPECTRORADIOMETRY
C. Daniel Sapp Sep. 1980 54 p refs
(Contract EPA-IAG-E7-21DJ)
(PB81-154064; TVA/ONR-80/11; EPA-600/7-80-159) Avail: NTIS HC A04/MF A01 CSCL 06F

Remote measurements of spectral reflectance were made in a laboratory to study sulfur dioxide (SO2) effects on the foliage of soybean and winter wheat plants. The relationship between spectral reflectance and foliar injury from SO2 was analyzed by separating injury into its components chlorosis and necrosis and reflectance into bands within the visible and near infrared spectra for winter wheat, total visible reflectance as well as individual wavelength bands distinguish the O2 effects. Remote sensors that measure visible reflectance may be able to distinguish moderate to severe injury to wheat from low altitudes. Scans of soybeans provided less positive results. Significant differences in the means of green, red, and near infrared reflectance were found when unaffected and moderately to severely necrotic soybean classes were compared. GRA

N81-25483# Environmental Protection Agency, Washington, D.C. Office of Pesticides and Toxic Substances.
SOIL BIOLOGY AS RELATED TO LAND USE PRACTICES; PROCEEDINGS OF THE 7TH INTERNATIONAL SOIL ZOOLOGY COLLOQUIUM OF THE INTERNATIONAL SOCIETY OF SOIL SCIENCE (ISSS)
Daniel L. Dindal, ed. 1980 898 p refs Colloq. held in Syracuse, N.Y., 29 Jul. - 3 Aug. 1979 Prepared in cooperation with State Univ. of New York, Syracuse
(PB81-155251; EPA-560/13-80-038) Avail: NTIS HC A99/MF A01 CSCL 08M

The influence of pesticides on soil organisms, human waste disposal and soil organisms, and anthrophilic relationships of soil organisms were investigated. Basic soil ecology was discussed with emphasis on the human impact on tropical soil ecology. Nutrient cycling, microorganism-faunal relationships, and feeding *and reproductive strategies* were reviewed. T.M.

44 ENERGY PRODUCTION AND *CONVERSION*

Includes specific energy conversion systems, e.g., *fuel cells and batteries;* global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels, and *85 Urban Technology and Transportation.*

N81-25484 Texas Univ. at Arlington.
THE ANALYSIS AND DESIGN OF LIQUID ABSORBENT/ DESICCANT COOLING/DEHUMIDIFICATION SYSTEMS FOR LOW GRADE THERMAL ENERGY APPLICATIONS
Ph.D. Thesis
Chung Shiang Patrick Peng 1980 286 p
Avail: Univ. Microfilms Order No. 8109222

The basic theory for falling film heat and mass transfer equipment was developed and used to derive mathematical models for each component of the system. Parametric studies were performed on the important components such as the absorber, the evaporator and the regenerator to analyze the performance of each component and to provide necessary information for system design and synthesis. System simulations using these mathematical models were also performed to identify the optimum system system configuration and to provide further system design information. A new system concept, the hybrid absorption/ desiccant cooling/dehumidification system, prompted from the system simulation study, is proposed and analyzed. This hybrid system appears to be attractive for low grade thermal energy applications in air conditioning. Dissert. Abstr.

N81-25485 De Langen (L. H.), Gooreind (Belgium).
EXAMINATION OF POSSIBILITIES TO IMPROVE ENERGY-PRODUCTION BY MAKING USE OF THE COLD AIR AT HIGH LEVEL OF THE ATMOSPHERE
L. H. DeLangen Aug. 1979 62 p refs 3 Vol.
(Rept-3) Copyright. Avail: Issuing Activity

The design of the wall of a tower with a diameter of 500 m and a height of 11 km is presented. The tower is to be used for ammonia vapor transportation thus creating a large thermoelectric generator. The tubes for discharge of liquid ammonia are described. Estimates for the total amount of construction materials are given. Two major mechanical aspects in the design of the tower are considered: vibration of the tower and bending of the tower by wind forces. T.M.

N81-25486# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
AN APPROACH TO THE MODELLING OF THE SOUTH AFRICAN ENERGY ECONOMY
J. G. vanZyl Jun. 1980 31 p refs
(CSIR-SWISK-16) Avail: NTIS HC A03/MF A01

A normative model is introduced with detailed energy sectors. The linear programming formulation incorporates an input-output description of the economy, the time horizon being 35 years, divided into seven five-year periods. An alternative formulation of the model allows substitution to take place between compatible energy sources. The purpose of the model is to study the influence of change in price and availability of energy carriers on the attainment of an economic objective, and to derive optimal energy supply strategies. The important outputs of the model are production levels and the distribution of production between consumption and investment: with a view on the one hand to the maintenance of a desirable standard of living, and on the other hand to the maintenance and expansion of production facilities. T.M.

N81-25487*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

OVERVIEW: DOE/NASA AUTOMOTIVE GAS TURBINE AND STIRLING PROJECTS

Donald G. Beremand 1981 17 p Presented at the Heat Pump Contractors' Program Integration Meeting, McLean, Va., 2-4 Jun. 1981

(Contract DE-AI01-77CS-51040)

(NASA-TM-82637; DOE/NASA/51040-28; E-890) Avail: NTIS HC A02/MF A01 CSCL 10B

An overview on the progress of the automotive gas turbine and automotive Stirling engine technology projects is presented. The following items are reported: (1) formulation and execution of projects in accordance with the Auto Propulsion Research and Development Act of 1978; (2) substantive technology accomplishments; and (3) future path options of the programs. E.A.K.

N81-25488*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CONCEPTUAL DESIGN STUDY OF A COAL GASIFICATION COMBINED-CYCLE POWERPLANT FOR INDUSTRIAL COGENERATION

Harvey S. Bloomfield, S. G. Nelson (McKee (Davy) Corp.), H. F. Straight (McKee (Davy) Corp.), T. K. Subramaniam (McKee (Davy) Corp.), and R. G. Winklepleck (McKee (Davy) Corp.) Mar. 1981 49 p

(Contract NAS3-22105-AE)

(NASA-TM-81687; E-723) Avail: NTIS HC A03/MF A01 CSCL 10B

A conceptual design study was conducted to assess technical feasibility, environmental characteristics, and economics of coal gasification. The feasibility of a coal gasification combined cycle cogeneration powerplant was examined in response to energy needs and to national policy aimed at decreasing dependence on oil and natural gas. The powerplant provides the steam heating and baseload electrical requirements while serving as a prototype for industrial cogeneration and a modular building block for utility applications. The following topics are discussed: (1) screening of candidate gasification, sulfur removal and power conversion components; (2) definition of a reference system; (3) quantification of plant emissions and waste streams; (4) estimates of capital and operating costs; and (5) a procurement and construction schedule. It is concluded that the proposed powerplant is technically feasible and environmentally superior. E.A.K.

N81-25489*# Volvo Flygmotor A.B., Trollhaettan (Sweden).

ON VARIABLE HYDROSTATIC TRANSMISSION FOR ROAD VEHICLES, POWERED BY SUPPLY OF FLUID AT CONSTANT PRESSURE

Mart Magi (Solvo AB, Goteborg), Are Freivald, Ingvar Andersson (Solvo AB, Goteborg), and Ulf Ericsson (Solvo AB, Goteborg) May 1981 122 p refs

(Contract NASw-3299)

(NASA-CR-165246; Rept-301-7663) Avail: NTIS HC A06/MF A01 CSCL 13F

Various hydrostatic power transmission systems for automotive applications with power supply at constant pressure and unrestricted flow and with a Volvo Flygmotor variable displacement motor as the principal unit were investigated. Two most promising concepts were analyzed in detail and their main components optimized for minimum power loss at the EPA Urban Driving Cycle. The best fuel consumption is less than 10 lit. per 100 kM for a 1542 kG vehicle with a hydrostatic motor and a two speed gear box in series (braking power not recovered). Realistic system pressure affects the fuel consumption just slightly, but the package volume/weight drastically. Back pressure increases losses significantly. Special attention was paid to description of the behavior and modeling of the losses of variable displacement hydrostatic machines. Author

N81-25490*# National Bureau of Standards, Washington, D.C. Metallurgy Div.

NON-NOBLE CATALYSTS AND CATALYST SUPPORTS FOR PHOSPHORIC ACID FUEL CELLS Quarterly Report, Dec. 1980 - Feb. 1981

A. J. McAlister 11 Mar. 1981 19 p refs

(NASA Order C-46229-D; Contract DE-AI01-80ET-17088) (NASA-CR-165308; DOE/NASA/6229-2; QR-2) Avail: NTIS HC A02/MF A01 CSCL 10A

Four different samples of the cubic alloys W sub x-1 Ti sub x C sub 1-y were prepared and found to be active and CO tolerant. When the activities of these cubic alloys were weighted by the reciprocal of the square of the W exchange, they displayed magnitudes and dependence on bulk C deficiency comparable to those of highly active forms of WC. It is concluded that they may offer important insight into the nature of the active sites on, and means for improving the performance of, W-C anode catalysts for use in phosphoric acid fuel cells. R.C.T.

N81-25491*# Department of Energy, Washington, D. C.

SOLAR HEATING AND HOT WATER SYSTEM INSTALLED AT ALDERSON BROADDUS COLLEGE, PHILIPPI, WEST VIRGINIA Final Technical Report

May 1981 89 p

(Contract EM-78-F-01-5228)

(NASA-CR-161756) Avail: NTIS HC A05/MF A01 CSCL 10A

Data needed necessary to evaluate the design and operation of a solar energy heating and hot water system installed in a commercial application are presented. The information includes system descriptions, acceptance test data, schematics, as built drawing, problems encountered, all solutions and photographs of the system at various stages of completion. A.R.H.

N81-25492*# Technical Report Services, Rocky River, Ohio.

SURVEY OF LONG-TERM DURABILITY OF FIBERGLASS REINFORCED PLASTIC STRUCTURES Final Report

Seymour Lieblein Jan. 1981 52 p refs

(NASA Order C-39549-D; Contract EX-76-I-01-1028)

(NASA-CR-165320; DOE/NASA/9549-1; TRS-106) Avail: NTIS HC A04/MF A01 CSCL 10A

Included are fluid containment vessels, marine structures, and aircraft components with up to 19 years of service. Correlations were obtained for the variation of static fatigue strength, cyclic fatigue strength, and residual burst strength for pressure vessels. In addition, data are presented for the effects of moisture on strength retention. Data variations were analyzed, and relationships and implications for testing are discussed. Change in strength properties for complete structures was examined for indications of the effects of environmental conditions such as moisture and outdoor exposure (ultraviolet radiation, weathering) on long term durability. T.M.

N81-25493*# Union Carbide Corp., Oak Ridge, Tenn.

LOW COST SOLAR ARRAY PROJECT: EXPERIMENTAL PROCESS SYSTEM DEVELOPMENT UNIT FOR PRODUCING SEMICONDUCTOR-GRADE SILICON USING THE SILANE-TO-SILICON PROCESS Quarterly Progress Report, Jan. - Mar. 1981

Mar. 1981 83 p Sponsored in part by NASA and DOE

(Contract JPL-954334)

(NASA-CR-164451; DOE/JPL-954334-18; DRL-81; DRD-SE-6; JPL-9950-550) Avail: NTIS HC A05/MF A01 CSCL 10A

The results of the free space reactor experimental work are summarized. Overall, the objectives were achieved and the unit can be confidently scaled to the EPSDU size based on the experimental work and supporting theoretical analyses. The piping and instrumentation of the fluidized bed reactor was completed. T.M.

N81-25494*# California Inst. of Tech., Pasadena.

STUDY OF THE EFFECTS OF IMPURITIES ON THE PROPERTIES OF SILICON MATERIALS AND PERFORMANCE OF SILICON SOLAR CELL Annual Technical Report

C. T. Sah Mar. 1981 30 p refs Sponsored in part by NASA and DOE

(Contract JPL-954685)

(NASA-CR-164452; JPL-9950-54; DOE/JPL-954685-81/4; ATR-4) Avail: NTIS HC A03/MF A01 CSCL 10A

The effect of silicon film thickness on the energy conversion efficiency of a back surface field solar cell is investigated. A computer-aided design study on the dependence of efficiency peaks on the concentrations of the recombination and dopant

impurities is presented. The illuminated current voltage characteristics of over 100 cell designs were obtained using the transmission line circuit model to numerically solve the Shockley Equations. Using an AM1 efficiency of 17% as a target value, it is shown that the efficiency versus thickness dependence has a broad maximum which varies less than 1% over more than three-to-one range of cell thickness from 30 to 100 microns. Optical reflecting back surface will give only a slight improvement of AM1 efficiency, about 0.7%, in this thickness range. The sensitive dependence of efficiency on patchiness across the back surface field, low high junction in thin cells is noted. J.D.H.

N81-25495*# Hemlock Semiconductor Corp., Mich.
DEVELOPMENT OF A POLYSILICON PROCESS BASED ON CHEMICAL VAPOR DEPOSITION, PHASE 1 Quarterly Progress Report, 1 Oct. - 31 Dec. 1980
J. McCormick, K. Sharp, A. Arvidson, and D. Sawyer Mar. 1981 37 p refs
(Contract JPL-955533)
(NASA-CR-164453; DOE/JPL-955533-81/5; JPL-9950-542; DRL-125-DRD-SE-2) Avail: NTIS HC A03/MF A01 CSCL 10A

The development of a dichlorosilane-based reductive chemical vapor deposition process for the production of polycrystalline silicon is discussed. Experimental data indicate that the ease of ignition and explosion severity of dichlorosilane (DCS)/air mixtures is substantially attenuated if the DCS is diluted with hydrogen. Redesign of the process development unit to accommodate safety related information is described. Several different sources of trichlorosilane were used to generate a mixture of redistributed chlorosilanes via Dowex ion exchange resin. The unseparated mixtures were then fed to an experimental reactor in which silicon was deposited and the deposited silicon analyzed for electrically active impurities. At least one trichlorosilane source provided material of requisite purity. Silicon grown in the experimental reactor was converted to single crystal material and solar cells fabricated and tested. M.G.

N81-25496*# Mobil Tyco Solar Energy Corp., Waltham, Mass.
LARGE AREA SILICON SHEET BY EFG Quarterly Report, 1 Jan. - 31 Mar. 1981
29 May 1981 45 p refs Sponsored by NASA and DOE Prepared for JPL
(Contract JPL-954355)
(NASA-CR-164449; DOE/JPL-954355-81/17) Avail: NTIS HC A03/MF A01 CSCL 10A

A multiple growth run with three 10 cm cartridges was carried out with the best throughput rates and time percentage of simultaneous three ribbon growth achieved to date in this system. Growth speeds were between 3.2 and 3.6 cm/minute on all three cartridges and simultaneous full width growth of three ribbons was achieved 47 percent of the time over the eight hour duration of the experiment. Improvements in instrumentation and in the main zone temperature uniformity were two factors that have led to more reproducible growth conditions in the multiple ribbon furnace. T.M.

N81-25497*# Spire Corp., Bedford, Mass.
DEVELOPMENT AND FABRICATION OF A SOLAR CELL JUNCTION PROCESSING SYSTEM Quarterly Progress Report, 1 Jan. 31 Mar. 1980
Robert Kiesling Apr. 1981 33 p refs Sponsored in part by DOE Prepared for JPL
(Contracts NAS7-100; JPL-955640)
(NASA-CR-164444; DOE/JPL-955640-81/5; QR-10073-05; QPR-5) Avail: NTIS HC A03/MF A01 CSCL 10A

The major component fabrication program was completed. Assembly and system testing of the pulsed electron beam annealing machine are described. The design program for the transport reached completion, and the detailed drawings were released for fabrication and procurement of the long lead time components. T.M.

N81-25498*# RCA Labs., Princeton, N. J.
EVALUATION AND VERIFICATION OF EPITAXIAL PROCESS SEQUENCE FOR SILICON SOLAR-CELL PRODUCTION Quarterly Report, 27 Jan. - 31 Mar. 1981
D. Redfield Apr. 1981 22 p refs Sponsored in part by DOE Prepared for JPL
(Contracts NAS7-100; JPL-955825)
(NASA-CR-164445; DOE/JPL-955825-81/1; JPL-9950-551; QR-1) Avail: NTIS HC A03/MF A01 CSCL 10A

Several process sequences are shown to be of potentially low cost and to perform effectively when applied to the high quality silicon crystals for which they were developed. The extent to which such process sequences can also perform effectively when applied to lower cost thin film solar cells formed by epitaxial deposition of Si on potentially inexpensive substrates of upgraded metallurgical grade Si was investigated. T.M.

N81-25499*# SRI International Corp., Menlo Park, Calif.
NOVEL DUPLEX VAPOR-ELECTROCHEMICAL METHOD FOR SILICON SOLAR CELLS Final Report, Jun. 1976 - Feb. 1980
Leonard Nanis, Angel Sanjurjo, Kenneth M. Sancier, Vijay K. Kapur, Robert W. Bartlett, and Sylvia Westphal 31 Mar. 1980 80 p refs Sponsored in part by DOE Prepared for JPL
(Contracts NAS7-100; JPL-954471)
(NASA-CR-164446; DOE/JPL-954471-80/13; JPL-9950-548) Avail: NTIS HC A04/MF A01 CSCL 10A

A process was developed for the economic production of high purity Si from inexpensive reactants, based on the Na reduction of SiF4 gas. The products of reaction (NaF, Si) are separated by either aqueous leaching or by direct melting of the NaF-Si product misture. Impurities known to degrade solar cell performance are all present at sufficiently low concentrations so that melt solidification (e.g., Czochralski) will provide a silicon material suitable for solar cells. T.M.

N81-25500*# Spectrolab, Inc., Sylmar, Calif.
DESIGN, ANALYSIS, AND TEST VERIFICATION OF ADVANCED ENCAPSULATION SYSTEM Triannual Report
Alec Garcia and Chuck Minning May 1981 22 p
(Contract JPL-955567)
(NASA-CR-164442; DOE/JPL-955567/81/3; JPL-9950-547; DRL-126; DRD-SE-8) Avail: NTIS HC A02/MF A01 CSCL 10A

Procurement of 4 in x 4 in polycrystalline solar cells were proceeded with some delays. A total of 1200 cells were procured for use in both the verification testing and qualification testing. Additional thermal structural analyses were run and the data are presented. An outline of the verification testing is included with information on test specimen construction. Author

N81-25501*# General Electric Co., Philadelphia, Pa. Advanced Energy Programs Dept.
INTEGRATED RESIDENTIAL PHOTOVOLTAIC ARRAY DEVELOPMENT Quarterly Report
N. F. Shepard, Jr. 18 May 1981 90 p Sponsored by NASA and DOE Prepared for JPL
(Contract JPL-955894)
(NASA-CR-164447; DOE/JPL-955894-2) Avail: NTIS HC A05/MF A01 CSCL 10A

Three basic module design concepts were analyzed with respect to both production and installation costs. The results of this evaluation were used to synthesize a fourth design which incorporates the best features of these initial concepts to produce a module/array design approach which offers the promise of a substantial reduction in the installed cost of a residential array. A unique waterproofing and mounting scheme was used to reduce the cost of installing an integral array while still maintaining a high probability that the installed array will be watertight for the design lifetime of the system. This recommended concept will also permit the array to be mounted as a direct or stand-off installation with no changes to the module design. T.M.

N81-25502*# Springborn Labs., Inc., Enfield, Conn.
INVESTIGATION OF TEST METHODS, MATERIAL PROPERTIES, AND PROCESSES FOR SOLAR CELL ENCAPSULANTS Quarterly Progress Report, 12 Nov. 1980 - 12 Feb. 1981
P. B. Willis, B. Baum, and A. Goulet 12 Feb. 1981 28 p ref Sponsored by NASA and DOE Prepared for JPL
(Contract JPL-954527)
(NASA-CR-164448; DOE/JPL-954527-81/18; QPR-19) Avail: NTIS HC A03/MF A01 CSCL 10A

The development of pottant compounds is emphasized. Formulation of the butyl acrylate syrup/casting pottant was completed. The formulation contains an ultraviolet stabilizer system and may be cured with an initiator that, unlike former selections, presents no shipping of handling hazards to the user. The catalyzed syrup is stable at room temperature and has a pot life of at least eight hours. The formulation of the ethylene/methyl acrylate lamination pottant was also completed. This compound is the alternative pottant to EVA and is similarly produced as an extruded sheet that is wound into rolls. This resin is inherently nonblocking. T.M.

N81-25503*# United Technologies Research Center, East Hartford, Conn.

AUTOIGNITION CHARACTERISTICS OF NO. 2 DIESEL FUEL Final Report

J. A. TeVelde and L. J. Spadaccini Jun. 1981 20 p refs

(Contracts NAS3-20066; Contract DE-AI01-77CS-1040)

(NASA-CR-165315; DOE/NASA/0066-2; R81-915281-1) Avail: NTIS HC A02/MF A01 CSCL 21B

Parametric tests to map the ignition delay characteristics were conducted at pressures of 3, 4, and 5 atm, inlet air temperatures up to 1150 K and fuel air equivalence ratios ranging from 0.2 to 1.0. Ignition delay times in the range of 6 msec to 60 msec at freestream flow velocities ranging from 10 m/sec to 40 m/sec were obtained. The ignition delay times appeared to correlate with the inverse of pressure and the inverse exponent of temperature. T.M.

N81-25504*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

ENERGY: AN ANNOTATED SELECTED BIBLIOGRAPHY

Sandra J. Blow, comp., Richard W. Peacock, comp., and Joseph J. Sholy, comp. Dec. 1979 599 p 2 Vol.

(NASA-TM-82364; BIB-74-01-App-3-Vol-1) Avail: NTIS HC A99/MF A01 CSCL 10A

This updated bibliography contains approximately 7,000 selected references on energy and energy related topics from bibliographic and other data sources from June 1977. Under each subject heading the entries are arranged by the data, with the latest works first. Subject headings include: resources supply/demand, and forecasting; policy, legislation, and regulation; environment; consumption, conservation, and economics; analysis, systems, and modeling, and information sources and documentation. Fossil fuels, hydrogen and other fuels, liquid/solid wastes and biomass, waste heat utilization, and nuclear power sources are also included. J.M.S.

N81-25505*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

ENERGY: AN ANNOTATED SELECTED BIBLIOGRAPHY

Sandra J. Blow, comp., Richard W. Peacock, comp., and Joseph J. Sholy, comp. Dec. 1979 739 p 2 Vol.

(NASA-TM-82365; BIB-74-01-App-3-Vol-2) Avail: NTIS HC A99/MF A01 CSCL 10A

This updated bibliography contains approximately 7,000 selected references on energy and energy related topics from bibliographic and other data sources from June 1977. Under each subject heading the entries are arranged by the date, with the latest works first. Geothermal, solar, wind, and ocean/water power sources are included. Magnetohydrodynamics and electrohydrodynamics, electric power engineering, automotive power plants, and energy storage are also covered. J.M.S.

N81-25506# Committee on Energy and Natural Resources (U.S. Senate).

PACIFIC BASIN ENERGY

Washington GPO 1980 551 p refs Hearings on H.R. 7330 before the Comm. on Energy and Nat. Resources, 96th Congr., 2nd Sess., Honolulu, 10-11 Jul. 1980

(Publ-96-145; GPO-68-055) Avail: Committee on Energy and Natural Resources

Testimony is presented concerning pending legislation which provides for the assessment and development of the potential for renewable energy sources in the U.S. insular areas, including the trust territories. Options for self-sufficiency throughout the Pacific basin are considered in light of rapidly escalating fuel costs. A.R.H.

N81-25507# Committee on Science and Technology (U. S. House).

WIND ENERGY SYSTEMS ACT OF 1980

Washington GPO 1980 432 p Hearings before the Subcomm. on Energy Develop. and Appl. of the Comm. on Sci. and Technol., 96th Congr., 1st Sess., no. 137, 18, 24, 26 Sep. and 17 Oct. 1979

(GPO-56-735) Avail: Subcommittee on Energy Development and Applications

The establishment of a 7 year $1 billion accelerated research and development program for windpower utilization is discussed. The goals of the legislation are to make wind energy cost competitive with conventional energy sources and to have in place at the end of the 7 year program 100 megawatts of wind machine capacity. At least 5 megawatts of the total would be for small wind machines. T.M.

N81-25508*# Honeywell Systems and Research Center, Minneapolis, Minn.

SPECTROPHOTOVOLTAIC ORBITAL POWER GENERATION Progress Report

Gary Knowles, Dave Stoltzman, Ray Lin, and Sau Kwan Lo 18 Dec. 1980 59 p

(Contract NAS8-33511)

(NASA-CR-161795) Avail: NTIS HC A04/MF A01 CSCL 10A

A system with 1000 : 1 concentration ratio is defined, using a cassegrain telescope as the first stage concentration (270 x) and compound parabolic concentrators (CPC) for the second stage concentration of 4.7 x for each spectral band. Using reported state of the art (S.O.A.) solar cells device parameters and considering structural losses due to optics and beamsplitters, the efficiencies of one to four cell systems were calculated with efficiencies varying from approximately 22% to 30%. Taking into account cost of the optics, beamsplitter, radiator, and the cost of developing new cells the most cost effective system is the GaAs/Si system. T.M.

N81-25509# Committee on Science and Technology (U. S. House).

OVERSIGHT: DOE SOLAR AND CONSERVATION PROGRAMS

Washington GPO 1980 213 p refs Hearings before the Subcomm. on Energy Develop. and Application of the Comm. on Sci. and Technol., 96th Congr., 2nd Sess., No. 157, 12 Jun. and 9 Sep. 1980

(GPO-65-855) Avail: Subcommittee on Energy Development and Applications

The research management in the programs was examined. The allocation of Federal funds was investigated with respect to the total expenditures for solar/conservation vs. fossil fuels development. Charts are presented which show decreases in the fraction of the budget for the programs. Program goals were defined and recommendations for added private sector involvement are made. T.M.

N81-25510*# IBM Federal Systems Div., Huntsville, Ala.

SOLAR ENERGY SYSTEM ECONOMIC EVALUATION FOR SEECO LINCOLN, LINCOLN, NEBRASKA Final Report

Sep. 1980 97 p refs Sponsored in part by DOE

(Contract NAS8-32036)

(NASA-CR-161724) Avail: NTIS HC A05/MF A01 CSCL 10A

The economic analysis of the solar energy system that was installed at Lincoln, Nebraska is developed for this and four other sites typical of a wide range of environmental and economic conditions in the continental United States. This analysis is accomplished based on the technical and economic models in the f chart design procedure with inputs based on the characteristics of the installed system and local conditions. The results are expressed in terms of the economic parameters of present worth of system cost over projected twenty year life: life cycle savings, year of positive savings and year of payback for the optimized solar energy system at each of the analysis sites. The sensitivity of the economic evaluation to uncertainties in constituent system and economic variables is also investigated. Author

N81-25511# ECO, Inc., Cambridge, Mass.
ELECTROLYTES FOR HYDROCARBON AIR FUEL CELLS Final Technical Report, 27 Sep. 1979 - 27 Sep. 1980
M. Walsh, F. Walsh, D. N. Crouse, and R. S. Morris Jan. 1981 47 p refs
(Contract DAAK70-79-C-0165)
(AD-A096448) Avail: NTIS HC A03/MF A01 CSCL 10/2

Perfluorocarbon acids show promise for replacing phosphoric acid in direct oxidation fuel cells. Difluoromethane diphosphonic acid was synthesized and found to have: twice the ionic conductivity of phosphoric acid; thermal stability above 236 C; electrochemical stability between 0-1.0V vs. RHE; low vapor pressure at 200 C and high viscosity; non-corrosive properties toward fuel cell components; and high rates of electroxidation of hydrogen and high rates of electroreduction of oxygen. T.M.

N81-25512# Naval Postgraduate School, Monterey, Calif.
OPTIMIZATION OF A LOW DELTA T RANKINE POWER SYSTEM M.S. Thesis
Raymond C. Schaubel Dec. 1980 236 p refs
(AD-A098567) Avail: NTIS HC A11/MF A01 CSCL 20/13

The Ocean Thermal Energy Conversion (OTEC) uses the low thermal energy potential available from ocean temperature gradients. A method is presented to analyze such systems and, for this purpose, a comprehensive simulation is developed. The simulation includes parasitic power requirements, losses due to interconnecting lines, and heat exchanger pressure drops. Cost functions are included and numerical optimization is employed to obtain optimal designs based upon minimum cost. The analysis is converted to a computer code and coupled to the COPES/CONMIN optimization code to facilitate a fully automated design where the computer makes the design decisions and performance trade-off studies. The final product is an optimum power system module design for the designated net electrical output required and the specified system and design constraints. Preliminary results are presented for a range of system power levels. Optimum designs are obtained and compared for systems in which either titanium or aluminum tubes are used in the heat exchangers. GRA

N81-25513# Duracell International, Inc., Burlington, Mass.
LITHIUM-THIONYL CHLORIDE BATTERY Final Report, 1 Oct. 1978 - 30 Nov. 1980
D. Wong, W. Bowden, N. Hamilton, D. Cubbison, and A. N. Dey Apr. 1981 290 p refs
(Contract DAAB07-78-C-0563; DA Proj. 1L1-62705-AH-94)
(AD-A098727; DELET-TR-78-0563-F) Avail: NTIS HC A13/MF A01 CSCL 10/3

The main objective is to develop, fabricate, test, and deliver safe high rate lithium-thionyl chloride batteries for various U.S. Army applications such as manpack ratios and GLLD Laser Designators. We have devoted our efforts in the following major areas: (1) Optimization of the spirally wound D cell for high rate applications, (2) Development of a 3 inch diameter flat cylindrical cell for the GLLD laser designator application, and (3) Investigation of the reduction mechanism of SOCl2. The rate capability of the spirally wound D cell previously developed by us has been optimized for both the manpack radio (BA5590) battery and GLLD laser designator battery application in this program. A flat cylindrical cell has also been developed for the GLLD laser designator application. It is 3 inches in diameter and 0.9 inch in height with extremely low internal cell impedance that minimizes cell heating and polarization on the GLLD load. Typical cell capacity was found to be 18.0-19.0 Ahr with a few cells delivering up to about 21.0 Ahr on the GLLD test load. Study of the reduction mechanism of SOCl2 using electrochemical and spectroscopic techniques has also been carried out in this program which may be directly relevant to the intrinsic safety of the system. GRA

N81-25514# Midwest Research Inst., Golden, Colo.
DEVELOPMENT OF HIGH-EFFICIENCY CASCADE SOLAR CELLS
Jan. 1981 25 p refs
(Contract DE-AC02-77CH-00178)
(SERI/PR-8136-1-T2; TPR-4) Avail: NTIS HC A02/MF A01

The technology required to fabricate two junction cascade solar cells having conversion efficiencies of 30 percent or more under multisun illumination is being developed. An intermediate objective is to demonstrate cascade cells were previously demonstrated in two different 3-5 materials systems: AlGaAsSb/GaAsSb and AlGaAs/GaAs. Although both of these cells were grown by liquid phase epitaxy, organo-metallic chemical vapor deposition growth techniques are also being explored. DOE

N81-25515# Midwest Research Inst., Golden, Colo.
SOLAR ENERGY STORAGE RESEARCHERS INFORMATION USER STUDY
W. W. Belew Mar. 1981 213 p refs
(Contract DE-AC02-77CH-00178)
(SERI/TR-751-793) Avail: NTIS HC A10/MF A01

The results of a series of telephone interviews with groups of users of information on solar energy storage are described. Results from 2 groups of researchers are analyzed: DOE-funded researchers and Non-DOE-funded researchers. The data will be used as input to the determination of information products and services the Solar Energy Research Institute, the Solar Energy Information Data Bank Network, and the entire information outreach community should be preparing and disseminating. DOE

N81-25516# Midwest Research Inst., Golden, Colo.
GENERAL SOLAR ENERGY INFORMATION USER STUDY
W. W. Belew, B. L. Wood, T. L. Marle, and C. L. Reinhardt Mar. 1981 237 p refs
(Contract DE-AC02-77CH-00178)
(SERI/TR-751-753) Avail: NTIS HC A11/MF A01

The results of a series of telephone interviews with groups of users of information on general solar energy are presented. These results identify types of information each group needed and the best ways to get information to each group. Results from 13 groups of respondents are analyzed: loan officers, real estate appraisers, tax assessors, insurers, lawyers, utility respresentatives, public interest group representatives, information and agricultural representatives, public interest group representatives, information and agricultural specialists at state cooperative extension service offices, and state energy office representatives. The data will be used as input to the determination of information products and services the Solar Energy Research Institute, the Solar Energy Information Data Bank Network, and the entire information outreach community should be preparing and disseminating. DOE

N81-25517# California Univ., Livermore. Lawrence Livermore Lab.
ELECTRICITY GENERATION BY SOLAR CENTRAL RECEIVERS
David W. Dorn 3 Mar. 1981 9 p refs
(Contract W-7405-eng-48)
(UCID-18977) Avail: NTIS HC A02/MF A01

Various approaches for generating electricity are being explored that can lead to a cost effective solar central receiver plant. Experimental data were accumulated, and pilot plants are now being built. The projected capital cost (1979 dollars) of a commercial solar central receiver plant with a 50% capacity factor is about $1400/kW sub e. The cost of electricity from such a plant is expected to be about 7.5 cents/kWh. DOE

N81-25518# Michigan Univ., Ann Arbor. Architectural Research Lab.
SOLARIZATION/CONSERVATION TECHNOLOGY DEVELOPMENT PROGRAM FOR EXISTING HOUSING Progress Report
W. Oberdick 1 Feb. 1981 14 p
(Contract DE-FG02-80R5-10227)
(DOE/R5-10227/1) Avail: NTIS HC A02/MF A01

A four month period of project organization, data file examination, development of concepts and technical study of S/C components is covered. At the start of the project 188 residences were considered appropriate for studying this program. All of these houses in the course of three years have had code update assistance. This included some conservation retrofit. The city of Ann Arbor was selected for a pilot study of the RCS Audit program. As of this date an initial 200 audits have been completed. Also, the C D office is presently undertaking the conservation retrofit of several residences in accordance with

RCS recommendations. Available aerial photographs proved to be inadequate for solar site evaluation. The conservation updates and the RCS audits present an opportunity for evaluation and comparisons. DOE

N81-25519# Midwest Research Inst., Golden, Colo.
PHOTOVOLTAICS: SOLAR ELECTRIC POWER SYSTEMS
Feb. 1980 21 p
(Contract DE-AC02-77CH-00178)
(SERI/SP-433-487) Avail: NTIS HC A02/MF A01

The operation and uses of solar cells and the National Photovoltaic Program are briefly described. Eleven DOE photovoltaic application projects are described including forest lookout towers; Wilcox Memorial Hospital in Hawaii; WBNO daytime AM radio station; Schuchuli Indian Village; Meade, Nebraska, agricultural experiment; Mt. Laguna Air Force Station; public schools and colleges; residential applications; and Sea World of Florida. DOE

N81-25520# Boeing Co., Seattle, Wash. Solar Heating and Cooling Demonstration Program Dept.
SOLAR PROJECT DESCRIPTION FOR HOMES BY MARILYNN MULTI-FAMILY RESIDENCE, ALBUQUERQUE, NEW MEXICO
David Moore 2 Mar. 1981 59 p
(Contract DE-AB01-76CS-31020)
(SOLAR/1008-80/50) Avail: NTIS HC A04/MF A01

The system is designed to provide solar energy for space heating and preheating DHW. Solar energy is collected by 18 liquid flat plate collectors with a gross area of 346 square feet. Solar energy is transferred from the collector array to a 1000 gallon storage tank. Freeze protection is provided by a 50% ethylene glycol and 50% water. Solar energy is delivered to a liquid-to-air heat exchanger in the space heating subsystem in order to preheat outside air for the heat pump. Preheated city water is stored in a 30 gallon preheat storage tank and supplied, on demand, to a conventional 40 gallon DHW tank. DOE

N81-25521# Gerber (Sherman), Northbrook, Ill.
ENERGY CONSERVATION THROUGH OPTIMUM UTILIZATION OF SITE ENERGY SOURCES FOR ALL SEASON THERMAL COMFORT IN NEW RESIDENTIAL CONSTRUCTION FOR SINGLE FAMILY ATTACHED (ROWHOUSE/TOWNHOUSE) DESIGNS Interim Report
Sherman Gerber and J. Peter Holsman 26 Feb. 1981 16 p
(Contract DE-FG02-80R5-10215)
(DOE/R5-10215/1) Avail: NTIS HC A02/MF A01

A proposed design analysis is presented of a passive solar energy efficient system for a typical three level, three bedroom, two story, garage under townhouse. The design incorporates the best, most performance proven and cost effective products, materials, processes, technologies, and subsystems which are available today. Seven distinct categories recognized for analysis are identified as: the exterior environment; the interior environment; conservation of energy; natural energy utilization; auxiliary energy utilization; control and distribution systems; and occupant adaptation. Preliminary design features, fenestration systems, the plenum supply system, the thermal storage party fire walls, direct gain storage, the radiant comfort system, and direct passive cooling systems are briefly described. DOE

N81-25522# Eaton Industries of Houston, Inc., Tex. Geopressured-Geothermal Program.
TESTING GEOPRESSURED GEOTHERMAL RESERVOIRS IN EXISTNG WELLS. VOLUME 2: WELL TEST DATA
1981 228 p refs
(Contract DE-AC08-80ET-27081)
(DOE/ET-27081/1-Vol-2) Avail: NTIS HC A11/MF A01

Data from the reopening of an abandoned well are presented. The data include: reservoir pressure drawdown and buildup data, Institute of Gas Technology test data, Institute of Gas Technology sample log, reservoir fluid analysis, produced gas/water ratio, chemical analysis procedures, surface flow data, third party sampling and reports, sand detectors charts, and Horner-type buildup data. DOE

N81-25523# Battelle Pacific Northwest Labs., Richland, Wash.
EVALUATION OF CRITICAL MATERIALS IN FIVE ADDITIONAL ADVANCE DESIGN PHOTOVOLTAIC CELLS
S. A. Smith, R. L. Watts, P. Martin, and W. E. Gurwell Feb. 1981 133 p refs
(Contract DE-AC06-76RL-01830)
(PNL-3710) Avail: NTIS HC A07/MF A01

Potential material supply constraints due to the large scale deployment of five advanced photovoltaic (PV) cell designs were identified and strategies to reduce the impacts of these production capacity limitations and potential future material are suggested. The Critical Materials Assessment Program (CMAP) screens the designs and their supply chains and identifies potential shortages which might preclude large scale use of the technologies. The results of the screening of five advanced v cell designs are presented: (1) indium phosphide/cadmium sulfide; (2) zinc phosphide; (3) cadmium telluride/cadmium sulfide; (4) copper indium selenium; and (5) cadmium selenide photoelectrochemical. Each of these five cells is screened individually. The CMAP methodology, used to identify critical materials, is described. Detailed characterizations of the advanced photovoltaic cell designs, descriptions of additional cell production processes, and the results are presented. DOE

N81-25524# Battelle Pacific Northwest Labs., Richland, Wash.
CANDIDATE WIND-TURBINE-GENERATOR SITE Annual Data Summary, Jan. - Dec. 1979
W. F. Sandusky and D. S. Renne Mar. 1981 34 p
(Contract DE-AC06-76RL-01830)
(PNL-3703) Avail: NTIS HC A03/MF A01

Summarized hourly meteorological data for fifteen candidate and wind turbine generator sites are presented. These data are collected for the Department of Energy for the purpose of evaluating the wind energy potential at these sites and are used to assist in selection of potential sites for installation and testing of large wind turbines in electric utility systems. For each site, data are given in eight tables and one figure. Use of information from these tables, with information about specific wind turbines, should allow the user to estimate the potential for wind energy production at each site. DOE

N81-25525# Acurex Corp., Mountain View, Calif. Alternate Energy Div.
SOLAR PRODUCTION OF INDUSTRIAL PROCESS STEAM. PHASE 3: OPERATION AND EVALUATION OF THE JOHNSON AND JOHNSON SOLAR FACILITY Final Report, 1 Jan. 1980 - 31 Mar. 1981
D. F. Brink, J. M. Kendall, and S. B. Youngblood Mar. 1981 115 p refs
(Contract DE-AC03-77CS-31713)
(DOE/CS-31713/T1) Avail: NTIS HC A06/MF A01

The facility consists of 1068 sq m of parabolic trough concentrating collectors, a 18,900 flash boiler, and an 18.6 kW circulating pump. In the first year of operation the system was available 97 percent of the days, and with sufficient solar radiation available it operated 70 percent of the days during this period. The measured data showed that the collector field operated at an efficiency of 25.4 percent for the year, and that at least 75 percent of the energy reaching the flash boiler was delivered to the plant as steam. A total of 309,510 kg of steam was produced by the solar facility for the first year. An analysis of the data showed that the delivered energy was within 90 to 100 percent of the predicted value. DOE

N81-25526# Argonne National Lab., Ill. Components Technology Div.
COMMIX-SA-1: A THREE-DIMENSIONAL THERMOHYDRODYNAMIC COMPUTER PROGRAM FOR SOLAR APPLICATIONS
W. T. Sha, E. I. H. Lin, R. C. Schmitt, K. V. Liu, J. R. Hull, J. J. Oras, Jr., and H. M. Domanus Nov. 1980 49 p refs
(Contract W-31-109-eng-38)
(ANL-80-8) Avail: NTIS HC A03/MF A01

The COMMIX-SA-1 is a three dimensional transient, single phase, compressible flow component computer program was developed. Its utilization for solar applications in general, and for analysis of thermocline storage tanks in particular. The conservation equations for mass, momentum, and energy are

solved as an initial boundary value problem. The numerical solution procedure, based on a modified ICE (Implicit Continous-Fluid Eulerian) technique; and method for treating the singularity problem arising at the origin of a cylindrical coordinate system are described. The thermal interactions between fluid and structures (tank walls, baffles, etc.) are accounted for. The COMMIX-SA-1 code structure is delineated, and an input description and sample problems are presented. DOE

N81-25527# Cornell Univ., Ithaca, N. Y. Lab. of Atomic and Solid State Physics.

DESIGN OF SELECTIVE SURFACES FOR SOLAR ENERGY COLLECTION

D. M. Trotter, Jr., H. G. Craighead, and A. J. Sievers 1981 13 p refs

(Contracts DE-AS03-77ET-20413; EG-77-S-03-1456; Grant NSF DMR-76-81083)

(DOE/ET-20413/T1) Avail: NTIS HC A02/MF A01

Numerical calculations done to determine the total hemispherical solar absorptivity and the total hemispherical emissivity in the infrared of selective surfaces composed of a dielectric film on a metal substrate are discussed. The selectivity of the surface as a function of the refractive index of the film is discussed, as well as the effect of grading the index of the film. It is concluded that the most effective film is one having n sub L as close to unity as possible through its entire thickness while k sub L increases from zero at the front surface to a larger value at the back surface. DOE

N81-25528# Colorado State Univ., Fort Collins. Solar Energy Applications Lab.

SOLAR HEATING AND COOLING OF RESIDENTIAL BUILDINGS: SIZING, INSTALLATION AND OPERATION OF SYSTEMS, 1980 EDITION

Sep. 1980 584 p refs

(Contract DE-AC02-79CS-30062)

(DOE/CS-30062/1:) Avail: NTIS HC A25/MF A01

A text for a training course on solar heating and cooling of residential buildings is presented. The course and text are directed toward sizing, installation, operation, and maintenance of solar systems for space heating and hot water supply. Solar cooling is treated only briefly. DOE

N81-25529# University of Southern California, Los Angeles. Lab. of Biomedical and Environmental Sciences.

COMMUNITY APPLICATIONS OF SMALL-SCALE SOLAR THERMAL ENERGY SYSTEMS

John H. Baldwin, Carl Steinberg, and David Stea Feb. 1981 177 p refs

(Contract DE-AC03-76SF-00012)

(UCLA-12/1279) Avail: NTIS HC A09/MF A01

Rapid technological development of small scale solar thermal energy systems (STES) may bring them on line before communities are adequately prepared for them. Information for analyzing and siting STES is presented along with discussions of community applications, regulations, impacts and incentives. By providing this information to community planners, it is hoped that barriers to STES utilization can be anticipated and mitigated. DOE

N81-25530# Michigan Univ., Ann Arbor.

EXPLORATORY ENERGY RESEARCH PROGRAM AT THE UNIVERSITY OF MICHIGAN Progress Report, 15 May - 15 Nov. 1980

W. Kerr 8 Dec. 1980 15 p

(Contract DE-FG02-80ER-10125)

(DOE/ER-10125/1) Avail: NTIS HC A02/MF A01

A grant to the University of Michigan for an Exploratory Energy Research Program is used by Office of Energy Research (OER) to support faculty research and graduate student research assistantships. Progress on activity during the first six months of the program is described and brief status reports on 20 energy related faculty research projects in the physical, engineering, biological, and behavioral sciences are presented. DOE

N81-25531# General Electric Co., St. Petersburg, Fla. Gas Turbine Div.

HIGH-RELIABILITY GAS TURBINE COMBINED-CYCLE DEVELOPMENT PROGRAM, VOLUME 1, PHASE 1 Final Report

R. G. Kunkel Jan. 1981 359 p refs Sponsored by Electric Power Research Inst.

(EPRI-AP-1681-Vol-1) Avail: NTIS HC A16/MF A01

The potential reliability of a gas turbine combined cycle power plant is determined. A centerline design approach, with the main design parameter being reliability, is used. The gas turbine, conceptually developed around a 1985 F (1085 C) firing cycle, is described. The total plant was developed with maintainability, serviceability, and the potential need for conversion to coal derived fuels and other duty cycles as the major design criteria. The cost effectiveness of the controls and accessories is evaluated. J.D.H.

N81-25532# Institute of Gas Technology, Chicago, Ill. IIT Center.

EFFECTS OF SULFUR-CONTAINING GASES ON THE PERFORMANCE OF MOLTEN CARBONATE FUEL CELLS Interim Report

T. E. Tang, T. D. Claar, and L. G. Marianowski Feb. 1981 48 p refs

(EPRI Proj. 1085-2)

(EPRI-EM-1699) Avail: NTIS HC A03/MF A01

The effects of low level sulfur impurities occurring as H2S or COS in low Btu fuel gas and as SO2 in the oxidant gas were studied. Cell performance responses to low sulfur excursions in fuel and/or oxidant are studied. Open circuit voltage is not affected by low levels of sulfur, and all performance loss occurs at the anode. For low Btu fuel inlet compositions, a 10 mV loss per ppM H2S at 160 mA/sq cm can be expected, and higher performance losses will occur under anode outlet conditions. The anode performance loss resulting from H2S is smaller at temperatures above the normal 6500 C operating temperature. The performance loss resulting from SO2 in the oxidant is more severe than that from the same level of H2S in the fuel. Performance losses are recovered after removal of sulfur from either fuel or oxidant. DOE

N81-25533# Westinghouse Research and Development Center, Pittsburgh, Pa.

DEVELOPMENT OF COPPER SULFIDE/CADMIUM SULFIDE THIN-FILM SOLAR CELLS Technical Progress Report, 13 Apr. - 12 Jul. 1980

J. R. Szedon, W. J. Biter, J. A. Abel, H. C. Dickey, and F. A. Shirland 27 Feb. 1981 73 p refs

(Contract DE-AC02-77CH-00178)

(SERI/PR-8143-1-T3; TPR-4) Avail: NTIS HC A04/MF A01

Aspects of cell fabrication and treatment which are critical for achieving high efficiency Cu2S/CdS solar cells were identified. Several comparisons were made of the effects of specific steps in two methods of cell fabrication. Three areas requiring special attention and specific means to achieve acceptable results were identified: (1) the Cu2S/CdS heterojunction area must be minimized; (2) termination of the wet barrier processing steps must be done carefully; (3) the Cu2S layer should not be exposed to high temperatures for long periods of time if surface absorbed moisture or oxygen are present. If precautions are taken, wet chemical barrier processing of thermally evaporated CdS films on zinc plated copper foil substrates yields cells of nearly 8% conversion efficiency without AR coating. DOE

N81-25534# United Technologies Research Center, East Hartford, Conn.

DESIGN, DEVELOPMENT AND TESTING OF A SOLAR-POWERED MULTI-FAMILY RESIDENTIAL SIZE PROTOTYPE TURBOCOMPRESSOR HEAT PUMP Interim Technical Report

Mar. 1981 314 p refs Prepared in cooperation with Hamilton Standard, Windsor Locks, Conn.

(Contract DE-AC03-77CS-34510)

(DOE/CS-34510/T1; UTRC/R79-953050-1) Avail: NTIS HC A14/MF A01

A solar system designed to use the turbocompressor heat pump module including all of the subsystems required and the various system operating modes is described. The preliminary design analyses conducted to select the heat pump module components and operating features, working fluid, configuration, size and performance goals, and estimated performance levels

in the cooling and heating modes are included. A detailed description of the other subsystems and components required for a complete solar installation is provided. Using realistic performance and cost characteristics for all subsystems, the seasonal performance of the UTC heat pump is described in various US locations. In addition, the estimated energy savings and an assessment of the economic viability of the solar system is presented. DOE

N81-25535# Sandia Labs., Albuquerque, N. Mex. Experimental Systems Operations Div.

MIDTEMPERATURE SOLAR SYSTEMS TEST FACILITY PREDICTIONS FOR THERMAL PERFORMANCE BASED ON TEST DATA. CUSTOM ENGINEERING TROUGH WITH GLASS REFLECTOR SURFACE AND SANDIA-DESIGNED RECEIVERS

Thomas D. Harrison May 1981 25 p ref
(Contract DE-AC04-76DP-00789)
(SAND-80-1964/10) Avail: NTIS HC A02/MF A01

Thermal performance predictions based on test data are presented for the trough and receivers for three output temperatures at five cities in the United States. Two experimental receivers were tested, one with an antireflective coating on the glass envelope around the receiver tube, and one without the antireflective coating. DOE

N81-25536# Midwest Research Inst., Golden, Colo.

ENERGY-CONSERVING AND PASSIVE-SOLAR CONSTRUCTION DETAILS

Robert D. Taylor Apr. 1981 29 p
(Contract DE-AC02-77CH-00178)
(SERI/SP-721-1135) Avail: NTIS HC A03/MF A01

Diagrams are presented which show construction details for insulating foundations, walls, joints, roofs, and other components of energy conserving residential and light commercial buildings: glazing systems; installing thermal mass; rock beds; and a passive hot air collector. The emphasis is on using commercially available building materials in new applications to minimize costs and maximize thermal design. The costs are given which are typical of what builders have incurred in different parts of the country. The thermal performance figures and comments are included. DOE

N81-25537# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

OCEAN ENERGY RESEARCHERS INFORMATION USER STUDY

W. W. Belew, B. L. Wood, T. L. Marie, and C. L. Reinhardt Mar. 1981 124 p refs
(Contracts DE-AC02-77CH-00178; ET-77-C-01-4042)
(SERI/TR-751-752) Avail: NTIS HC A06/MF A01

Results of a series of telephone interviews with groups of users of information on ocean energy systems are reported. Types of information each group needed and the best ways to get information to each group are discussed. Baseline data about information needs in the solar community is provided. Only high priority groups were examined. DOE

N81-25538# Midwest Research Inst., Golden, Colo. Solar Thermal Research Branch.

EXPERIMENTAL INVESTIGATION INTO FAST PYROLYSIS OF BIOMASS USING AN ENTRAINED FLOW REACTOR

Mark Bohn and Charles Benham Feb. 1981 19 p refs
(Contract DE-AC02-77CH-00178)
(SERI/TR-631-1004) Avail: NTIS HC A02/MF A01

Pyrolysis experiments were performed with steam as a carrier gas and two different feedstocks - wheat straw and powdered material derived from municipal solid waste (ECO-II TM). Reactor wall temperature was varied from 7000 to 1400 C. Gas composition data from the ECO-II tests were comparable to previously reported data but ethylene yield appeared to vary with reactor wall temperature and residence time. The important conclusion from the wheat straw tests is that olefin yields are about one half that obtained from ECO-II. Evidence was found that high olefin yields from ECO-II are due to the presence of plastics in the feedstock. DOE

N81-25539# Spire Corp., Bedford, Mass.

SILICON CONCENTRATOR SOLAR CELL DEVELOPMENT

Mar. 1981 84 p refs
(Contract DE-AC04-76DP-00789)
(SAND-81-7005) Avail: NTIS HC A05/MF A01

Discussions include the development of the device design, the development of the manufacturing process sequence, and the accompanying cost analyses. Several concentrator cell designs were developed that are compatible with cell assemblies using conventional and electrostatically bonded coverglasses. The cell geometries are suitable for 20 to 50 sun line or point focus concentrator optical systems with illuminated areas that are 5 cm wide. The process sequence required to manufacture the cell is based on ion implantation and pulse annealing for junction and back surface field formation. DOE

N81-25540# Sandia Labs., Livermore, Calif.

MOLTEN NITRATE SALT TECHNOLOGY DEVELOPMENT

R. W. Carling, C. M. Kramer, R. W. Bradshaw, D. A. Nissen, S. H. Goods, R. W. Mar, J. W. Munford, M. M. Karnowsky, R. N. Biefeld, and N. J. Norem Mar. 1981 102 p refs Prepared in cooperation with Sandia National Labs., Albuquerque, N. Mex.
(Contract DE-AC04-76DP-00789)
(SAND-80-8052) Avail: NTIS HC A06/MF A01

Of the fluids proposed for heat transfer and energy storage, molten nitrate salts offer significant economic advantages. The nitrate salt of most interest is a binary mixture of NaNO3 and KNO3. Although nitrate/nitrite mixtures were used for decades as heat transfer and heat treatment fluids the use was at temperatures of about 4500 C and lower. In solar thermal power systems the salts will experience a temperature range of 350 to 6000 C. Because central receiver applications place more rigorous demands and higher temperatures on nitrate salts a comprehensive experimental program was developed to examine what effects, if any, the new demands and temperatures have on the salts. The experiments include corrosion testing, environmental cracking of containment materials, and determinations of physical properties and decomposition mechanisms. DOE

N81-25541*# IBM Federal Systems Div., Huntsville, Ala.

SOLAR ENERGY SYSTEM ECONOMIC EVALUATION FOR SOLARON AKRON, AKRON, OHIO Final Report

Sep. 1980 106 p refs Prepared for DOE
(Contract NAS8-32036)
(NASA-CR-161729) Avail: NTIS HC A06/MF A01 CSCL 10A

The economic analysis of the solar energy system that was installed at Akron, Ohio is developed for this and four other sites typical of a wide range of environmental and economic conditions. The analysis is accomplished based on the technical and economic models in the f chart design procedure with inputs based on the characteristics of the installed parameters of present worth of system cost over a projected twenty year life: life cycle savings, year of positive savings and year of payback for the optimized solar energy system at each of the analysis sites. The sensitivity of the economic evaluation to uncertainties in constituent system and economic variables is also investigated. Results show that only in Albuquerque, New Mexico, where insolation is 1828 Btu/sq ft/day and the conventional energy cost is high, is this solar energy system marginally profitable. M.G.

N81-25542*# IBM Federal Systems Div., Huntsville, Ala.

SOLAR ENERGY SYSTEM ECONOMIC EVALUATION FOR IBM SYSTEM 1B, CARLSBAD, NEW MEXICO Final Report

Sep. 1980 99 p refs Prepared for DOE
(Contract NAS8-32036)
(NASA-CR-161730) Avail: NTIS HC A05/MF A01 CSCL 10A

The economic performance of an operational test site of a solar energy system is described. The viability of the system was tested over a broad range of environmental and economic conditions. Significant results are reported. R.C.T.

N81-25543# UOP, Inc., Des Plaines, Ill.

STABILITY OF KOCITE ELECTROCATALYSTS IN PHOSPHORIC ACID FUEL CELLS Final Report

L. B. Welsh, R. W. Leyerle, D. S. Scarlata, and M. A. Vanek
Feb. 1981 67 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 1200-3)
(EPRI-EM-1711) Avail: NTIS HC A04/MF A01

The experimental procedures, including the test conditions and analyses, are described. The electrocatalyst characterizations and test results are given for Kocite electrocatalysts tested in both compacted powder and PTFE bonded electrodes. DOE

N81-25544# CCB/CUMALI Associates, Oakland, Calif.
UNIFIED INTERZONE AND SYSTEM COUPLING METHODOLOGY FOR BUILDING ENERGY ANALYSIS
R. Sullivan, S. Nozaki, and Z. O. Cumali 16 Feb. 1981 96 p refs
(Contract DE-AC03-80SF-10840)
(DOE/SF-10840/T1) Avail: NTIS HC A05/MF A01

The current techniques employed by two public domain energy analysis simulation programs: DOE 1/2 (weighting factor) and BLAST (thermal balance) are discussed. Although these programs perform their primary function quite well, the applicability of the methods to situations in which there exists strong coupling between the zones and systems in a building is open to question. Particularly for passive solar design schemes, the approximations utilized would seem to be somewhat unreliable. Alternative coupling techniques are discussed which amounted to extensions of the basic algorithms involved to yield simultaneous solutions among the zones and systems. Both the weighting factor and thermal balance approaches are treated in addition to the concepts of radiosity and mean radiant temperature. DOE

N81-25545# Gould, Inc., Rolling Meadows, Ill.
DEVELOPMENT OF ZINC-BROMINE BATTERIES FOR UTILITY ENERGY STORAGE Interim Report, Sep. 1978 - Aug. 1979
R. A. Putt Mar. 1981 149 p refs Sponsored by Electric Power Research Inst.
(Contract EW-78-C-02-4984; EPRI Proj. 635-2)
(EPRI-EM-1717) Avail: NTIS HC A07/MF A01

Full-size zinc-bromide cell hardware in the form of three kWh submodules was built and tested. A cost-design study of an 80 kW module is provided. Conversion from the monopolar to bipolar cell design was achieved at the 8 kWh submodule level with a minimal perturbation on the hardware construction and testing schedule; one bipolar submodule was built and tested. The 80 kWh stand-alone module comprises 10 identical 8 kWh submodules of the bipolar electrode configuration, electrolyte circulation systems (pumps, tanks, and plumbing) for both the negative and positive electrolytes, and a bromine storage system. DOE

N81-25546# Mueller Associates, Inc., Baltimore, Md.
ECONOMIC ANALYSIS OF RESIDENTIAL COMBINED SOLAR-HEATING AND HOT-WATER SYSTEMS
23 Sep. 1980 79 p refs
(Contract W-31-109-eng-38)
(ANL-K-80-63; MAI-202) Avail: NTIS HC A05/MF A01

The monthly costs and savings of the typical system are discussed. The economic evaluation of solar residential systems is presented in increasing levels of complexity. Utilizing a typical system, the effective interest rate that the purchaser of a system would receive on money invested is shown for all regions of the country. The importance of numerous variables that can make a significant difference on the economics of the system is described so that it can be determined whether the typical system economics are compatible with the particular situation. Methods for calculating the payback period for any non-typical solar system are described. This calculated payback period is then shown to be related to the effective interest rate that the purchaser of the system would receive for a typical economic condition. DOE

N81-25547# Living Systems, Winters, Calif.
THE SUNCATCHER AND COOL POOL
Jonathan Hammond 1 Mar. 1981 104 p
(Contracts EG-77-G-04-4153; DE-FG04-77CS-34153)
(DOE/CS-34153/4) Avail: NTIS HC A06/MF A01

A simple, conical solar concentrating device that captures light entering clerestory windows and directs it onto thermal storage elements at the back of a south facing living space was designed to capture low angle winter sunlight and to reflect away higher angle summer sunlight. It is found that winter radiation through a Suncatcher window is 40 to 50 percent higher than through an ordinary window, and that the average solar fraction is 59 percent. Five Suncatcher buildings are described. An evaporating, shaded roof pond thermosiphons cool water into water filled columns within a building. Preliminary experiments indicate that the best shade design has unimpeded north sky view, good ventilation, complete summer shading, a low architectural profile, and low cost attic vent lowers work. Although an unshaded pool cools better at night than a shaded one, daytime heat gain far offsets this advantage. DOE

N81-25548# Mueller Associates, Inc., Baltimore, Md.
ECONOMIC ANALYSIS OF RESIDENTIAL AND COMMERCIAL SOLAR HEATING AND HOT WATER SYSTEMS
23 Sep. 1980 90 p refs
(Contract W-31-109-eng-38)
(ANL-K-80-59; MAI-206) Avail: NTIS HC A05/MF A01

Two distinct methods of analysis were used to evaluate both taxable and nontaxable applications of solar heating and hot water systems in residential and commercial buildings. The case flow analyses provide insight into the short and long term effects of a solar investment on the budget of the solar energy system purchaser while the return on investment analyses provide an appropriate method of measuring the attractiveness of a solar investment in comparison to alternative long term investments. The sensitivity of the results on the numerous variables in the economic analyses is shown. Maps provide a graphic display of the results of the economic analysis of typical systems using Federal and state tax credits and average state conventional fuel costs for each system type. Conclusions based on the economic analyses performed and a discussion of the present status of the data required for the complete economic evaluation of solar energy systems are summarized. DOE

N81-25549# Northrup, Inc., Hutchins, Tex.
SECOND GENERATION HELIOSTAT DEVELOPMENT FOR SOLAR CENTRAL RECEIVER SYSTEMS DETAILED DESIGN REPORT. VOLUME 2: APPENDICES
May 1980 315 p Prepared in cooperation with Bechtel National, Inc., San Francisco and Booz-Allen and Hamilton, New York
(Contract DE-AC04-76DP-00789)
(SAND-79-8194-Vol-2-App) Avail: NTIS HC A14/MF A01

Drawings and other data pertinent to the design, manufacture, installation, and control of a second generation heliostat are presented. These include: (1) a bill of materials; (2) subassembly drawings; (3) heliostat assembly drawings; (4) trade studies; (5) system studies; (6) control software; (7) test results; (8) specification S-102: surface preparation, application, and inspection of protective coatings for carbon steel heliostat piles; and (9) specification S-101: installation of open end pipe piles. For additional information on the heliostat design, manufacture, installation, maintenance and cost estimates see STAR document N81-22553. A.R.H.

N81-25550# Owens-Corning Fiberglas Corp., Granville, Ohio. Research and Development Div.
COMPRESSION-MOLDED ENERGY-STORAGE FLYWHEELS
John F. Kay Oct. 1980 41 p refs
(Contract W-7405-eng-48)
(UCRL-15324) Avail: NTIS HC A03/MF A01

Structural sheet molding component (SMC) consisting of chopped glass fiber reinforcement was used to fabricate energy storage flywheel discs which have the potential to store up to 25 W hr/lb (55 W hr/kg). The discs, 21 in. in dia and up to one inch thick, were compression molded using E glass and S-2 glass reinforcement chopped to either one or two inches in length in a polyester matrix. In the molding of the one inch thick parts, a proprietary Owens-Corning Fiberglas Corporation (OCF) molding process was used to preclude the formation of gross internal defects due to entrapped exotherm heat of reaction and nonisothermal curing conditions. DOE

N81-25551# RE/SPEC, Inc., Rapid City, S. Dak.
NUMERICAL STUDIES OF COMPRESSED AIR ENERGY STORAGE CAVERNS IN HARD ROCK

T. Brandshaug and Arlo F. Fossum 1980 8 p refs
(Contract DE-AC06-76RL-01830)
(PNL-SA-9029) Avail: NTIS HC A02/MF A01

It is concluded that there is adequate information available to enable a designer to design an underground opening with the size, shape, and depth required of a CAES cavern with regard to its excavation and construction, based on a combination of numerical modeling and precedent considerations. It is recommended that numerical methods be used in combination with in situ tests to permit the development of a design methodology for the operation of a CAES cavern. DOE

N81-25552# Naval Postgraduate School, Monterey, Calif.
PERFORMANCE OF AN EHD POWER GENERATOR WITH A TWO-FLUID EJECTOR Final Report
T. H. Gawain and Oscar Biblarz Jan. 1981 85 p refs
(Contract ER-78-A-03-2122)
(AD-A098583; NPS-80-004) Avail: NTIS HC A05/MF A01 CSCL 10/2

A detailed analysis and method of calculation is presented for determining the complete thermodynamic cycle of a two-fluid electrohydrodynamic (EHD) power generator. The analysis takes fully into account the compressibility of the media. Parameters are included which express the thermodynamic losses in the various components of the overall system. The severe restriction on output created by the electrical breakdown limit of the medium is clearly shown. The method for computing the net-electrical work output per unit mass of primary fluid and the net overall thermal efficiency of the system is carefully developed. A sample output together with the FORTRAN program are included. GRA

N81-25553# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
FLASH PHOTOELECTROCHEMICAL STUDIES OF TRANSIENT ELECTRODE PROCESSES IMPORTANT IN SOLAR ENERGY CONVERSION Progress Report, 1 May 1980 - 30 Apr. 1981
Sam P. Perone Dec. 1980 22 p refs
(Contract DE-AS02-77ER-04263)
(DOE/ER-04263/4) Avail: NTIS HC A02/MF A01

The program objectives related to pulsed laser irradiation of semiconductor/liquid junction photoelectrochemical cells were: detect and characterize transient photoproducts due to electrode and/or solution photoelectrolysis at the interface; obtain time resolved photoelectrolysis data indicative of charge transfer rates; obtain photoelectrochemical measurements related to electron hole recombination rates subsequent to pulsed laser irradiation; and utilize complementary spectroscopic methods for characterizing transient photoprocesses at the semiconductor/electrolyte interface. The dynamics of supersensitizer interactions with sensitizing dyes adsorbed at the interface were characterized. DOE

N81-25554# United Technologies Corp., South Windsor, Conn.
ADVANCED-TECHNOLOGY FUEL-CELL PROGRAM Final Report
J. A. S. Bett, C. A. Bushnell, and R. F. Buswell Electric Power Research Inst. Mar. 1981 239 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 114)
(EPRI-EM-1730) Avail: NTIS HC A11/MF A01

The development of molten carbonate fuel cells and advanced phosphoric acid fuel cells is summarized. Increased liquid fuels and coal fuel capabilities are discussed. Various power conditioning systems are described. T.M.

N81-25555# United Technologies Corp., South Windsor, Conn.
ADVANCED-TECHNOLOGY FUEL-CELL PROGRAM Summary Report
J. A. S. Bett, C. A. Bushnell, and R. F. Buswell Electric Power Research Inst. Mar. 1981 39 p Sponsored by Electric Power Research Inst.
(EPRI Proj. 114)
(EPRI-EM-1730-SY) Avail: NTIS HC A03/MF A01

Descriptions of fuel cell power plants used for utility application are presented. The suitability of initial power plant technology was examined. Developments in molten carbonate and advanced phosphoric acid fuel cells are reported. Improved fuel capabilities and power conditioning investigations are summarized. T.M.

N81-25556# Oak Ridge National Lab., Tenn.
FOSSIL ENERGY PROGRAM Progress Report, Jan. 1981
L. E. McNeese Mar. 1981 111 p refs
(Contract W-7405-eng-26)
(ORNL/TM-7723) Avail: NTIS HC A06/MF A01

A compendium of monthly progress reports for the ORNL research and development programs that are in support of the increased utilization of coal and other fossil fuel alternatives as sources of clean energy is presented. The projects reported this month include those for coal conversion development, chemical research and development, materials technology, component development and process evaluation, technical support to major liquefaction projects, process analysis; and engineering evaluations, fossil energy environmental analysis, flue gas desulfurization, solid waste disposal, coal preparation and waste utilization, plant control development, atmospheric fluidized bed coal combustor for cogeneration, Tennessee Valley Authority Fluidized Bed Combustion demonstration plant program technical support, PFBC systems analysis, fossil fuel applications assessments, performance assurance system support for fossil energy projects, international energy technology assessment, and generalized equilibrium models of liquid and gaseous fuel supplies. DOE

N81-25557# Naval Weapons Center, China Lake, Calif.
PREPARATION AND CHARACTERIZATION OF HYDROGENATED AMORPHOUS SILICON Quarterly Progress Report, 1 Sep. - 30 Nov. 1980
T. M. Donovan 1980 11 p
(Contract DE-AC02-77CH-00178)
(SERI/PR-8142-4-T1; QPR-6) Avail: NTIS HC A02/MF A01

Direct current magnetron sputtering was evaluated as a viable approach to producing amorphous SiH thin films for solar photovoltaic applications. It is shown that the optical and transport properties of these films are similar to those of rf diode sputtered material, but the photoresponse and, more importantly, Schottky diode performance are inferior to that already obtained by rd diode sputtering. In order to improve film morphology, ion bombardment was added to the deposition process. Transmission electron microscopy and SIMS measurements are discussed. Optical properties, transport, and photoconductivity of oxygen doped rf diode films are discussed. DOE

N81-25558# Los Alamos Scientific Lab., N. Mex.
PRELIMINARY HOT DRY ROCK GEOTHERMAL EVALUATION OF LONG VALLEY CALDERA, CALIFORNIA
David T. Gambill Mar. 1981 26 p refs
(Contract W-7405-eng-36)
(LA-8710-HDR) Avail: NTIS HC A03/MF A01

Teleseismic data indicate a low P wave velocity zone below the western part of the caldera, indicating a magma chamber between 7 and 25 km depth. This conclusion is supported by gravity data. Heat flow just west of the caldera is 3.75 HFU. Just east of the caldera, measured heat flow is about 2 HFU. However, a deep well on the eastern edge of the resurgent dome has a gradient of 380C/km from 0.66 to 1.2 km suggesting that the magma chamber, which produced Long Valley, is largely crystallized below the resurgent dome. The high heat flow beneath the western caldera may be a manifestation of shallow silicic magma associated with the recent Inyo Craters. These data indicate a smaller magma source may lie below the western caldera. The higher temperature gradient and lack of caldera fill beyond the west margin of the caldera combine to make this area promising for future HDR evaluation. DOE

N81-25559# Sandia Labs., Albuquerque, N. Mex.
VERTICAL-AXIS WIND-TURBINE DRIVE-TRAIN TRANSIENT DYNAMICS
D. B. Clauss and T. G. Carne Mar. 1981 51 p refs
(Contract DE-AC04-76DP-00789)
(SAND-80-2646) Avail: NTIS HC A04/MF A01

Development and testing of a computer code for predicting drive train behavior at different loading conditions for a vertical axis wind turbine is described. The code is based on a lumped parameter model of the drive train. Testing for the low cost 17 meter wind turbine is described. Prediction of the effect of

a slip clutch on transient torque oscillations demonstrates that a slip clutch located between the motor and brake can reduce peak torques by 38 percent. DOE

N81-25560# Midwest Research Inst., Golden, Colo.
COMPARISON OF DOE-2 AND TRANSYS SOLAR HEATING SYSTEM SIMULATION
Anthony Eden and Marion Morgan Dec. 1980 73 p refs
(Contracts EG-77-C-01-0402; DE-AC02-77CH-00178)
(SERI/TR-721-822) Avail: NTIS HC A04/MF A01

The analysis of the output of the solar energy section called Component Based Simulation (CBS) is discussed. The adequacy and sensitivity of CBS when various active solar energy collectors and systems were interfaced with a standard space heating system were investigated. The analysis included both single and double glazed collectors with selectively and nonselectively coated absorbing surfaces located in four different environments. The results show the agreement between the two programs to be remarkably similar. Graphs are presented to illustrate the minor differences in annual average collector efficiency and annual average part solar as well as the thermal load and insolation levels. DOE

N81-25561*# *Argonne National Lab., Ill.*
SURVEY AND DOCUMENTATION OF EMERGING TECHNOLOGIES FOR THE SATELLITE POWER SYSTEM (SPS)
Peter Glaser and Phillip Chapman (Little (Arthur D.), Inc.) Apr. 1981 133 p refs Sponsored in part by NASA
(Contract W-31-109-eng-38)
(NASA-CR-164418; DOE/ER-0097) Avail: NTIS HC A07/MF A01 CSCL 01A

The genesis of the solar power satellite (SPS) concept is reviewed historically and the original assumptions and guidelines which led to development of the SPS reference system design concept are discussed. Some guidelines are applicable to almost any SPS design, but others can be changed, leading to new and perhaps preferable systems. In order to stimulate new SPS concepts and to facilitate comparative assessment of emerging SPS technologies, one useful approach is to break the overall system into functional parts. The system functions which must be performed by any SPS concept and the interrelations between them are discussed and a systematic framework is presented for assessing the wide variety of system concepts and subsystem technologies which have been proposed. About 80 alternative SPS technologies are reviewed. DOE

N81-25562# Automation Industries, Inc., Silver Spring, Md.
SOLAR ENERGY SYSTEM PERFORMANCE EVALUATION: LIVING SYSTEMS, DAVIS, CALIFORNIA, OCTOBER 1979 - FEBRUARY 1980
J. W. Spears 1980 78 p refs
(Contract DE-AC01-79CS-30027)
(SOLAR/1046-80/14) Avail: NTIS HC A05/MF A01

The solar energy system is designed to supply 88% of the space heating. It is equipped with 273 sq ft of south-facing double glazing for passive direct gain, 3343 gallons of water storage in site-built containers and six-inch concrete slab, and a 35,000 Btu gas furnace and a 30,000 Btu wood stove for auxiliary heating. The systems actually provided 80% of the space heat. DOE

N81-25563# *Automation Industries, Inc., Silver Spring, Md.*
SOLAR ENERGY SYSTEM PERFORMANCE EVALUATION: M. F. SMITH, JAMESTOWN, RHODE ISLAND, OCTOBER 1979 - APRIL 1980
E. N. Ashman 1980 92 p
(Contract DE-AC01-79CS-30027)
(SOLAR/1056-80/14-Rev) Avail: NTIS HC A05/MF A01

The active solar energy system is designed to supply 78% of the space heating requirements and 51% of the hot water. The gross collector array is 512 sq ft. The cover of the collector is made of a double glazing, light weight durable translucent fiberglass material, bonded to support aluminum I beam guide core. Water is the transfer medium of the collector. Heat from the collector is stored in a standing 3150 gallon concrete tank located in the basement of the house. Heat is distributed to the living area by a water to air heat pump with a heating capacity of 33,000 Btu/hr. The heat pump draws heat from the water and heats air which is blown throughout the house by means of a duct system. The systems actually produced 78% of the space heating requirements and 73% of the hot water. DOE

N81-25564# Motorola, Inc., Phoenix, Ariz.
CONCENTRATOR-SOLAR-CELL DEVELOPMENT Final Technical Report, 27 Mar. 1979 - 30 Mar. 1980
L. Grenon Mar. 1981 76 p refs Prepared for Sandia National Labs., Albuquerque, N. Mex.
(Contract DE-AC04-76DP-00789)
(SAND-81-7002) Avail: NTIS HC A05/MF A01

The continued development of high efficiency silicon concentrator solar cells is described. A critical examination of each process step and of the overall process sequence is made. Specific attention was given to the pattern etching and metallization processes, each of which had exhibited the widest degree of variability in earlier programs. Use of reactive ion, radio frequency plasma etching processes have greatly improved the quality of metal line width and silicon surface quality. Plated metallization requirements are investigated. Area which require continued work are identified. DOE

N81-25565# *Rockwell International Corp., Anaheim, Calif. Microelectronics Research and Development Center.*
CHEMICAL VAPOR DEPOSITION OF THIN-FILM POLYCRYSTALLINE SI FOR LOW-COST SOLAR CELLS Final Technical Report, 23 Jul. 1979 - 22 Jul. 1980
Ralph P. Ruth, William I. Simpson, Jane J. J. Yang, Lavada A. Moudy, Harold M. Manasevit, and Richard E. Johnson Sep. 1980 189 p refs
(Contract DE-AC03-79ET-23045)
(DOE/SF-23045/4; Rept-80-738/501) Avail: NTIS HC A09/MF A01

A one year research program was carried out for the purpose of developing thin film polycrystalline Si solar cells on low cost substrate materials, directed toward the goal of achieving photovoltaic conversion efficiencies greater than 10 percent (AM1) at a cost of $100 to $300/kW (electric). The polycrystalline Si films used for the cells were prepared by direct chemical vapor deposition (CVD) techniques, and the required junctions/barriers were formed both by doping during film growth and by subsequent thermal diffusion. DOE

N81-25566# Westinghouse Research and Development Center, Pittsburgh, Pa.
EMERGING MATERIAL SYSTEMS FOR SOLAR-CELL APPLICATIONS Technical Progress Report, 17 Oct. 1979 - 16 Jan. 1980
W. J. Biter and J. R. Szedon 23 Jul. 1980 20 p refs
(Contract DE-AC02-79ET-23003)
(DOE/ET-23003/3; TPR-3) Avail: NTIS HC A02/MF A01

The plasma deposition system was completed and a number of deposition of InP were made with the indium transported into the reaction zone via the vapor phase transport of indium chloride. Amorphous films of InP were obtained when the substrate was at room temperature. Substrate temperatures above approximately 200 C resulted in polycrystalline films. Junctions were formed in n type InP by diffusion of Cd using a sealed tube technique. DOE

N81-25567# *Brookhaven National Lab., Upton, N. Y.*
FUEL-CELL APPLIED RESEARCH: ELECTROCATALYSIS AND MATERIALS Quarterly Report, 1 Jan. - 31 Mar. 1980
S. Srinivasan, H. S. Isaacs, J. McBreen, W. E. OGrady, H. Olender, L. J. Olmer, E. J. L. Schouler, and K. V. Kordesch Sep. 1980 28 p refs
(Contract DE-AC02-76CH-00016)
(BNL-51319) Avail: NTIS HC A03/MF A01

Phosphoric acid electrolyte fuel cells and high temperature solid electrolyte fuel cells are discussed. The corrosion behavior of five furnace black carbon supports for platinum electrocatalysts in phosphoric acid was evaluated using a cyclic voltammetric technique. The electrode kinetic studies of the hydrogen oxidation and the oxygen reduction reactions on smooth platinum in phosphoric acid revealed that the entire decrease in performance of a fuel cell in this impure electrolyte is entirely due to the impurity. A mathematical model which describes the slow oxygen adsorption step is compared with the experimental

polarization and impedance results of uncontaminated platinum electrodes in contact with yttria stabilized zirconia electrolytes. Attempts to explain discrepancies are made by assuming that the adsorption of oxygen followed a Langmuir and then a Frumkin adsorption isotherm. It is concluded that a site variation occurred on the electrode surface when potentials were varied in the cathodic region. DOE

N81-25568# Oak Ridge National Lab., Tenn.
***FOSSIL ENERGY PROGRAM* Quarterly Progress Report, period ending 31 Dec. 1980**
L. E. McNeese Apr. 1981 409 p refs
(Contract W-7405-eng-26)
(ORNL-5727) Avail: NTIS HC A18/MF A01

Progress made during the period October 1 through December 31 for the Oak Ridge National Laboratory research and development projects, carried out in support of the increased utilization of coal and other fossil fuels as sources of clean energy, is described. DOE

N81-25569# State Univ. of New York at Buffalo. Dept. of Electrical Engineering.
MIS SOLAR CELLS ON THIN POLYCRYSTALLINE SILICON Progress Report, 1 Sep. - 30 Nov. 1980
W. A. Anderson Dec. 1980 84 p refs
(Contract DE-AC02-77CH-00178)
(SERI/PR-9080-1-T3; PR-3) Avail: NTIS HC A05/MF A01

The first task of this project involves electron-beam deposition of thin silicon films on low cost substrates. The goal is to obtain 20 (SIGMA)m thick films having 20 (SIGMA)m diameter crystallites which may be recrystallized to > 40 (SIGMA)m. Material characterization and device studies are to be included in efforts to reach a 6% conversion efficiency. The second task deals with MIS solar cell fabrication on various types of silicon including poly-Si, ribbon-Si, silicon on ceramic, and thin film silicon. Conduction mechanism studies, optimum engineering design, and modification of the fabrication process are to be used to achieve 13% efficiency on Xtal-Si and 11% efficiency on poly-Si. The third task involves more detailed test procedures and includes spectral response, interface and grain boundary effects, computer analysis, materials studies, and grain boundary passivation. DOE

N81-25570# South Dakota Univ., Vermillion.
PASSIVE SOLAR HEATING OF BUILDING WITH ATTACHED *GREENHOUSE* Final Report, 31 Aug. 1979 - 30 Aug. 1980
Robert W. Jones Aug. 1980 39 p
(Contract DE-AC02-79CS-30242)
(DOE/CS-30242/4) Avail: NTIS HC A03/MF A01

Research conducted on the attached greenhouse type of passive solar heating system in the north central region is described. The thermal performance of attached greenhouse buildings was analyzed in order to determine the component sizes and configurations which optimize performance. The analytical method is dynamic computer simulation using a thermal network model and actual hourly meteorological and solar radiation data from the north central region. A large number of computer simulation runs and resulting performance estimates for certain designs are described. Specific design guidelines useful to architects and builders are developed. DOE

N81-25571# TRW, Inc., McLean, Va. Energy Systems Planning Div.
ENERGY BALANCES IN THE PRODUCTION AND END USE OF ALCOHOLS DERIVED FROM BIOMASS. A FUELS-SPECIFIC COMPARATIVE ANALYSIS OF ALTERNATE ETHANOL PRODUCTION CYCLES
Oct. 1980 135 p refs
(Contract DE-AC01-79PE-70151)
(DOE/PE-70151/T5; TRW-97611-E002-UX-00) Avail: NTIS HC A07/MF A01

Questions of net gains in premium fuels that can be derived from the production and use of ethanol from biomass, and that for the US alcohol fuel program, energy balance need not be a concern. Three categories of fuel gain are discussed in the report: (1) net petroleum gain; (2) net premium fuel gain (petroleum and natural gas); and (3) net energy gain (for all fuels). In this study the investment of energy (in the form of premium fuels) in alcohol production includes all investment from cultivating, harvesting, or gathering the feedstock and raw materials, through conversion of the feedstock to alcohol, to the delivery to the end user. DOE

N81-25572# Centro Informazioni Studi Esperienze, Milan (Italy). Documentation Service.
OPTIMIZED DESIGN OF TOTAL ENERGY SYSTEMS: THE RETE PROJECT
P. Alia, F. Dallavalle, C. DeNard, F. Sanson, S. Veneziani, and G. Spagni 1980 41 p refs Presented at the 4th Intern. Conf. of Urban Heating, Sirmione, Italy, 12-15 May 1980
(CISE-1606) Avail: NTIS HC A03/MF A01

A design to optimize the utilization of primary energy sources, providing both electricity and heat, is described. A project plant will be located at Reggio Emilia (Italy). Several computer analyses were performed to provide climatic data, electric and heat demand diagrams, capacity dimensioning, plant operation simulation and economic analysis. This design methodology makes possible a total annual efficiency of 78% and fuel savings, as to a conventional system, of about 28%. Different processes are used in winter or summer, consisting of optimized combinations of diesel generators, auxiliary boilers, absortion chillers, and heat pumps, producing electricity with either refrigeration or heating. Author (ESA)

N81-25573# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
CONSERVATION AND ALTERNATIVE FUELS IN THE TRANSPORTATION SECTOR
25 Jun. 1980 439 p refs
(PB81-154098) Avail: NTIS HC A19/MF A01 CSCL 10A

A set of transportation energy conservation policy initiatives is described. From an energy efficiency viewpoint the efforts to improve the efficiency of automobiles, airplanes and trucks is effective. Shifting passengers from automobiles and airplanes to buses and trains, and shifting freight from aircraft and trucks to trains (and where practical, marine or pipeline modes) provides the largest energy savings. GRA

N81-25574# Calculon Corp., Arlington, Va.
***REVIEW OF THE DEPARTMENT OF ENERGY'S CONSERVATION AND SOLAR ENERGY PROGRAMS: A REPORT TO THE PRESIDENT AND CONGRESS* Final Report**
Jan. 1981 80 p refs
(Contract EPA-68-02-3078)
(PB81-154015; EPA-600/7-81-001) Avail: NTIS HC A05/MF A01 CSCL 10A

Findings and views gathered during the past year on Section 2 of the Federal Nonnuclear Energy Research and Development Act (Public Law 93-577) are summarized. Individuals from various sectors of the government and private industry met in a series of workshops and held a national hearing to review Federal energy conservation and solar energy programs. The discussion focused primarily on four key issues: energy policy analysis; program evaluation; DOE state and local assistance programs; research, development and application. GRA

N81-25575# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md. Applied Physics Lab.
ENERGY PROGRAMS AT THE JOHNS HOPKINS UNIVERSITY APPLIED PHYSICS LABORATORY Quarterly Report, Jul. - Sep. 1980
K. Yu. R. vonBriesen, J. E. Tillman, F. C. Paddison, and S. Kane Nov. 1980 39 p ref
(Contracts DE-AI01-79ET-27025; EX-76-A-36-1008)
(PB81-151615; JHU/APL/EQR/80-3) Avail: NTIS HC A05/MF A01 CSCL 10A

The programs are divided into four major areas of research. The Geothermal Energy Development Planning and Technical Assistance section reports on progress of geothermal related tasks. The Operational Research and Hydroelectric Power Development section includes small scale investigations in the southeastern states. The Seismotectonic Investigations section describes neotectonic investigations of the Manhattan Prong. The Energy Conversion and Storage Techniques section contains an evaluation of the Einstein refrigerator, OTEC pilot plant perfor-

mance calculations, and a study of landfill methane recovery. T.M.

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N81-25576# Committee on Environment and Public Works (U. S. Senate).
ECONOMIC IMPACT OF ACID RAIN
Washington GPO 1980 227 p refs Hearing before the Select Comm. on Small Business and the Comm. on Environ. and Public Works, 96th Congr., 2nd Sess., 23 Sep. 1980
(GPO-68-982) Avail: Select Committee on Small Business

The environmental and economic impact of acid rain is documented for the eastern United States (New York, Wisconsin) and Canada and Scandinavia. Damage to lakes and other water resources, fisheries, forests and agriculture is emphasized. S.F.

N81-25577# Stanford Univ., Calif.
PHYSICAL EFFECTS OF VEHICULAR DISTURBANCES ON ARID LANDSCAPES Final Report, 17 Oct. 1977 - 16 Oct. 1980
Bernard Hallet, Richard M. Iverson, Bern S. Hinckley, and Robert H. Webb 29 Feb. 1981 16 p refs
(Contract DAAG29-78-C-0004)
(AD-A096706; ARO-14724.2-GS) Avail: NTIS HC A02/MF A01 CSCL 08/13

Rain simulation experiments conducted in the western Mojave Desert, California, indicate that the use of off-road vehicles on arid lands increases the amount and frequency of water runoff and sheet-wash erosion. Detailed experiments with controlled motorcycle traffic over a loamy sand typical of this region, reveal that these responses are due to a decrease in soil porosity, infiltration capacity, effectiveness of surface stabilizers and hydraulic resistance to overland flow. These effects, which can result even under low vehicle use, tend to be long lived, particularly in arid areas where the slow rates of soil formation render soil loss practically irreversible on a human time scale. Results suggest that increases in pluvial erosion following ORV use on most slopes are inevitable, but that the magnitudes of those increases are least in areas of low-intensity and duration rains, high natural infiltration rate, low slope and abundant surface sand and gravel. T.M.

N81-25578# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
NOISEMAP: THE USAF'S COMPUTER PROGRAM FOR PREDICTING NOISE EXPOSURE AROUND AN AIRPORT
Jerry D. Speakman Dec. 1980 5 p refs
(AD-A094264; AFAMRL-TR-80-128) Avail: NTIS HC A02/MF A01 CSCL 20/1

Modeling features in NOISEMAP are described, including: excess sound attenuation under ground to ground propagation conditions that is aircraft type and power setting dependent; lateral (sideline) attenuation of flight noise levels at low aircraft to observer elevation angles; takeoff roll noise model that compensates for directivity and acceleration effects; flight profile segmentation to account for variations in engine power setting and airspeed; influence of turns on predicted flight noise level durations; effect of airbase (runway) altitude above sea level on thrust, airspeed, and acoustic impedance; and flexibility to generate noise contour maps for any specified average temperature and relative humidity conditions. S.F.

N81-25579# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
THE FATE AND EFFECTS OF CRUDE OIL SPILLED SUBARCTIC PERMAFROST TERRAIN IN INTERIOR ALASKA
Larry A. Johnson, Elena B. Sparrow, Thomas F. Jenkins, Charles M. Collins, Charlotte Davenport, and Terry T. McFadden Dec. 1980 77 p refs
(Contract EPA-78-D-F-0395)
(AD-A095491; CRREL-80-29) Avail: NTIS HC A05/MF A01 CSCL 06/6

Two experimental oil spills, one in winter and one in summer, of 7570 liters (2000 gallons) were made at a forest site. The winter-spill oil moved within the surface moss layer beneath the snow. The summer-spill oil moved primarily below the moss in the organic soil. The oil moved faster and further downslope in the summer spill. Oil in the winter spill stopped during the first day but remobilized and flowed downslope in the spring. The total area affected by the summer spill was nearly one and one-half times as large as that affected by the winter spill. The initial heat of the spilled oil had little measurable thermal effect on the soil. However, thaw depth significantly increased following two full thaw seasons. The greatest increases occurred beneath oil blackened surfaces. Evaporation of voltatile components is the most significant weathering process in the first two years. Volatiles evaporated faster from surface oil than from oil carried deeper into the soil profile. Microbial degradation has not been observed. The indigenous soil microbial populations responded differently to winter and summer oil applications, ranging from inhibition to stimulation, with stimulation appearing to predominate. T.M.

N81-25580# Lovelace Biomedical and Environmental Research Inst., Albuquerque, N. Mex. Inhalation Toxicology Research Inst.
POTENTIAL HEALTH AND ENVIRONMENTAL EFFECTS OF DIESEL LIGHT DUTY VEHICLES
R. G. Cuddihy, F. A. Seiler, W. C. Griggith, B. R. Scott, and R. O. McClellan Oct. 1980 68 p refs
(Contract DE-AC04-76EV-01013)
(LMF-82) Avail: NTIS HC A04/MF A01

Quantitative projections of changes that could occur in the levels of environmental pollutants and in the risks to humans as a result of light duty diesel vehicles are similar to risks for using gasoline engine vehicles. This assessment used current scientific information to identify new directions for DOE research programs. It includes the manufacture and service of products and facilities that are necessary to support the use of light duty diesel vehicles in the US. Socio-economic factors are included. DOE

N81-25581# Battelle Columbus Labs., Ohio.
CONSTRUCTION MATERIALS FOR WET SCRUBBERS, VOLUME 1 Final Report
H. S. Rosenberg, H. H. Krause, L. J. Nowacki, C. W. Kistler, J. A. Beavers, R. B. Engdahl, R. J. Dick, and J. H. Oxley Mar. 1981 154 p refs
(EPRI Proj. 982-14)
(EPRI-CS-1736-Vol-1) Avail: NTIS HC A08/MF A01

Experience with materials of construction in full scale lime/limestone wet FGD systems on boilers burning eastern or western coals is documented. Information was collected for the following FGD system components: prescrubbers, absorbers, spray nozzles, mist eliminators, reheaters, fans, ducts, expansion joints, dampers, stacks, storage silos, ball mills and slakers, pumps, piping and valves, tanks and thickeners, agitators and rakes, vacuum filters and centrifuges, and pond linings. Materials documentation and analysis includes successes, failures, reasons for success or failure, failure mechanisms, and relative costs of various materials. The results are designed to be a first step in aiding utilities and FGD equipment suppliers in selecting materials that will perform satisfactorily without unnecessary expense. Outlet ducts downstream from the outlet dampers, stack linings, prescrubbers, absorbers, reheaters, outlet ducts upstream of the outlet dampers dampers, pumps, piping and valves, spray nozzles, mist eliminators, fans, inlet and bypass ducts, expansion joints, storage silos, ball mills and slakers, tanks and thickeners, agitators and rakes, vacuum filters and centrifuges, and pond linings are all considered in terms of failure history. DOE

N81-25582# Arizona Univ., Tucson. Dept. of Biochemistry and Chemistry.
ENVIRONMENTAL EFFECTS ON ELECTRON TRANSFER FROM CHLOROPHYLL TRIPLET TO QUINONE: ROLE OF DIELECTRIC CONSTANT, VISCOSITY AND QUINONE STRUCTURE IN CELLULOSE ACETATE FILMS
Glen Cheddar and Gordon Tollin 1981 17 p refs
(Contract DE-AS02-78ER-04927)

(DOE/ER-04927/T4) Avail: NTIS HC A02/MF A01

Triplet quenching by a diffusional mechanism was found to occur in the dry film, with steric effects being a major determinant of quencher effectiveness. No formation of separated radicals was found under these conditions, probably because the high viscosity prevented separation of the initially formed radical-ion pair. When the film was subsequently exposed to water, triplet quenching became more effective and separated radical production occurred. This is attributed to effects of decreased microviscosity and increased dielectric constant. Both steric effects and quinone redox potential were found to influence radical yields. Rate constants for reverse electron transfer were independent of quinone redox potential. DOE

N81-25583# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.

ENERGY AND ENVIRONMENT DIVISION Annual Report, 1979

Jeffrey Kessel, ed. and Maya Osowitt, ed. Oct. 1980 446 p refs

(Contract W-7405-eng-48)

(LBL-11650) Avail: NTIS HC A19/MF A01

Research progress for 1979 is summarized in short reports in the following areas: Energy Analysis Program; Energy Efficient Buildings Program; Solar Energy Program; Chemical Process Research and Development Program; Environmental Research Program; combustion research; effects of pollutants on biological systems; atmospheric aerosol research; and applied research in laser spectroscopy and analytical techniques. Items within the scope of EDB have been entered individually. DOE

N81-25584# California Univ., Livermore. Lawrence Livermore Lab.

SCENARIOS FOR FUTURE ANTHROPOGENIC EMISSIONS OF TRACE GASES IN THE ATMOSPHERE

Donald J. Wuebbles Apr. 1981 9 p refs

(Contract W-7405-eng-48)

(UCID-18997) Avail: NTIS HC A02/MF A01

An assessment was made of possible future changes to the atmospheric concentrations of CO, CO2, N2O, CH4 and NO/x (= NO + NO2). The assessment was based on the current understanding of the processes that determine the atmospheric sources of these species and the potential for anthropogenic influence. The most reasonable future growth scenario of each species are discussed. Potential anthropogenic emissions for these species into the next century are still uncertain. DOE

N81-25585# Oak Ridge National Lab., Tenn. Environmental Sciences Div.

GUIDANCE FOR USE OF EXPERIMENTAL SYSTEMS TO EVALUATE EFFECTS OF STRESS IN MARINE ECOSYSTEMS

S. Marshall Adams Apr. 1981 68 p refs

(Contract W-7405-eng-26)

(ORNL/TM-7644) Avail: NTIS HC A04/MF A01

Based on a description, review, and evaluation of representative estuarine and marine microecosystems, recommendations and guidance are provided concerning use of these model systems for investigating ecosystem level responses to stress. Of the three major types of microecosystems that were used to simulate marine systems, the outdoor flow through design appears to be the most realistic for investigating ecosystem level responses to stress. DOE

N81-25586# Sandia Labs., Albuquerque, N. Mex. Exploratory Systems Dept.

GASES IN THE MARINE SEDIMENTARY ENVIRONMENT: CAUSES AND EFFECTS

Karen K. Grube Feb. 1981 44 p refs

(Contract DE-AC04-76DP-00789)

(SAND-81-0210) Avail: NTIS HC A03/MF A01

Gases in the marine sedimentary are investigated, first, looking at the origins of these gases and the states in which they exist; second, reviewing the various techniques used for detecting the presence of gases; and, third, examining the impact of gases on sediment properties emphasis is placed on interactions of engineering applications with the sea floor relevant to the exploration of energy sources of the world's oceans. DOE

N81-25587# TRW, Inc., Redondo Beach, Calif.

SCRUBBER-GENERATED PARTICULATE: LITERATURE SURVEY Final Report

R. F. Maddalone, B. Jackson, and C. Yu Mar. 1981 126 p refs Sponsored by Electric Power Research Inst.

(EPRI Proj. 982-11)

(EPRI-CS-1739) Avail: NTIS HC A07/MF A01

The growth of flue gas desulfurization (FGD) systems to remove SO2 and particulate matter raises concern over the potential emissions from the FGD system. The most prevalent type of FGD system is wet scrubbers that use a variety of alkaline solutions and gas contact schemes to remove the O2 from the flue gas. The present state of knowledge about scrubber generated particulate (SGP) was assessed with emphasis on sampling and analysis methods for SGP, mist eliminator entrainment, and particle penetration. Computer searches were supplemented by a manual review of selected documents and by telephone contacts to key individuals. Most of the available literature consists of studies on penetration by particle size and mist eliminator design and efficiency. Only a few cases of direct information on SGP were found. The information suggests that SGP may represent 10 to 50 percent of the particulate emitted from an FGD system; however, better sampling and analysis methods are needed to provide a definitive estimate of SGP. DOE

N81-25588# California Univ., Los Angeles. Dept. of Environmental Science and Engineering.

ENVIRONMENTAL EFFECTS OF SOLAR-THERMAL POWER SYSTEMS: ENVIRONMENTAL CONSIDERATIONS IN SITING A SOLAR-COAL HYBRID PLANT. 1: ENVIRONMENTAL ASSESSMENT

Feb. 1981 176 p refs 2 Vol.

(Contract DE-AC03-76SF-00012)

(UCLA-12/1282) Avail: NTIS HC A09/MF A01

Environmental concerns and uncertainties unique to siting a solar-coal hybrid power plant are identified. Environmental concerns are examined in the perspective of the facility's impact on the environment; the environment's impact on the facility; and intraplant impacts arising from the interaction of subsystems. The effect of the facility on the environment is dominated by the large area of land required which in turn produced significant environmental concerns in the areas of air quality, geology, hydrology, vegetation and wildlife, and aesthetics. Health and safety concerns unique to solar are associated primarily with fluid releases and misdirected heliostat reflections. The effect of the environment on the facility is dominated by air quality concerns which also dominated solar-hybrid subsystem interactions. Emissions from coal combustion and coal handling are viewed as significant problems which could compromise the efficiency of the facility. DOE

N81-25589# California Univ., Los Angeles. Dept. of Environmental Science and Engineering.

ENVIRONMENTAL EFFECTS OF SOLAR-THERMAL POWER SYSTEMS: ENVIRONMENTAL CONSIDERATIONS IN SITING A SOLAR-COAL HYBRID POWER PLANT. 2: AIR-QUALITY AND METEOROLOGICAL IMPACTS

Donald B. Hunsaker, Jr., Carolyn T. Hunsaker, and Richard L. Perrine Feb. 1981 102 p refs 2 Vol.

(Contract DE-AC03-76SF-00012)

(UCLA-12/1283) Avail: NTIS HC A06/MF A01

Environmental constraints to siting a conceptual solar/coal hybrid power plant are investigated. It was found that the hybrid plant was not likely to significantly affect either local or regional climate. Microclimatological effects would probably occur within and near the facility but the effects were not quantified. For worst-case scenarios, as much as several hundred grams of particulate matter from coal combustion might deposit on a single helistate in a 30 day period. Salt particles deposited from cooling tower operation and off-site fugitive dust sources could add comparable amounts under their respective worst-case scenarios. Natural and fugitive emissions from coal handling could also deposit significant but unquantified amounts of matter. Thus, a worst-case estimate would be that as much as kilogram quantities of matter could be deposited per heliostat in a 30 day period. The implications of these findings are presented. DOE

N81-25590# Automation Industries, Inc., Silver Spring, Md.
MARCH 1981 ENVIRONMENTAL DATA FOR SITES IN THE NATIONAL SOLAR DATA NETWORK
D. M. Roha Mar. 1981 222 p refs
(Contract DE-AC01-79CS-30027)
(SOLAR/0010-81/03) Avail: NTIS HC A10/MF A01

The data include insolation, temperatures, wind speed and direction, and humidity for each day. Insolation data include total, diffuse, direct, maximum and extraterrestrial insolation. Temperature data include average, daytime, nighttime, maximum and minimum temperatures, and system cold water inlet temperatures for sites with domestic hot water systems. Humidity data include day and night values and maximum and minimum values. Most data are taken every 5 min. Rapidly varying data are taken every 32 sec. A technical discussion of the instruments and measurements used is included. DOE

N81-25591# GEOMET, Inc., Gaithersburg, Md.
COMPARISON OF INDOOR AND OUTDOOR AIR QUALITY Final Report
D. J. Moschandreas, J. Zabransky, and D. J. Pelton Mar. 1981 234 p refs
(EPRI Proj. 1309)
(EPRI-EA-1733) Avail: NTIS HC A11/MF A01

Data are presented from a 24 month comprehensive study of the air quality in indoor non industrial environments. A nine month field study in the Boston metropolitan area monitored and compared indoor and outdoor air quality at ten residences and two office buildings. Seasonal variations were investigated under real life conditions. Sulfur dioxide and ozone concentrations were consistently higher outdoors while indoor levels of nonmethane hydrocarbons and carbon dioxide were consistently higher. In general, indoor concentrations of carbon monoxide, nitric oxide, and nitrogen dioxide are greater than corresponding outdoor levels in residences with gas facilities. The indoor concentrations of CO, NO and NO2 in residences with electric facilities are similar to outdoor levels. Concentrations of total suspended particulates were consistently higher indoors at all residences, but the differences was more pronounced at residences with smoking occupants. DOE

N81-25592# Illinois Inst. of Natural Resources, Chicago. State Water Survey Div.
ATMOSPHERIC EFFECTS OF COOLING LAKES Final Report
J. Vogel and F. Hoff Apr. 1981 130 p refs
(EPRI Proj. 578)
(EPRI-EA-1762) Avail: NTIS HC A07/MF A01

The atmospheric effects of waste heat dissipation from cooling lakes operated in conjunction with power plants was assessed through a program of field measurements and analysis. An 890 hectare (2200 acre) cooling lake in southwestern Illinois was instrumented to provide necessary meteorological measurements. Analyses showed that steam fog and its downwind extent are the major atmospheric effects associated with cooling lakes, and that these effects maximize in winter and fall. However, the lake-induced fog is usually confined to the lake and short distances downwind. Consequently, cooling lakes with water-air temperature differences similar to those reported in Illinois and within a similar climatic regime can be located within 2 to 3 km of major highways, airports, or other centers of activity adversely affected by fog without an appreciable interference in the normal performance of such activities. DOE

N81-25593# Environmental Protection Agency, Ann Arbor, Mich. Test and Evaluation Branch.
EXHAUST EMISSIONS FROM TWENTY LIGHT DUTY DIESEL TRUCKS
John C. Shelton Aug. 1980 29 p ref
(PB81-153785; EPA-AA-TEB-80-20) Avail: NTIS HC A03/MF A01 CSCL 13F

Results of an exhaust emission testing program are described. Twenty diesel-powered light-duty trucks were tested. Gross vehicle weight ratings for these trucks ranged from 5300 to 6200 lbs. Emission factors for light duty diesel-powered trucks were developed. An assessment of the emission durability of the engines and an evaluation of fuel economy are included. Mass emissions were also measured during individual steady state and transient modes of operation. The avearge emission test results were very low and similar to those from diesel engines in passenger cars. Diesel engines in light duty truck service demonstrate virtually no emission deterioration while in-use over their 'useful life' although two engines required major engine rebuilding before 50,000 miles. GRA

N81-25594# Water Resources Council, Washington, D.C.
REVIEW (104) OF REGIONAL WATER RESOURCE MANAGEMENT PLANS, WRC STAFF PROCEDURES
30 Jul. 1980 32 p
(PB81-155194) Avail: NTIS HC A03/MF A01 CSCL 13B

Guidance for Water Resource Council (WRC) staff and information on the review process for river basin commissions, other regional sponsors, Federal agencies, States, and other interested parties is provided. It contains the WRC review policy, review procedures, and the criteria to be followed by the WRC staff. An outline of a WRC review report is included with recommendations to the President. GRA

N81-25595# Iowa Dept. of Environmental Quality, Des Moines. Air and Land Quality Div.
IOWA AIR QUALITY REPORT, 1979 Annual Report
Jul. 1980 67 p refs
(PB81-154213) Avail: NTIS HC A04/MF A01 CSCL 13B

Iowa's air monitoring data from 1957 to 1979 are compiled in the report for seven pollutants monitored in the state: suspended particulates; sulfur dioxide; nitrogen dioxide; carbon monoxide; hydrocarbons; ozone; and lead. The data are presented in tabular form for each pollutant. Additional sections discussing the pollutants and pollutant sources, the air monitoring network, and the analysis of data and trends are added. GRA

N81-25596# Environmental Protection Agency, Ann Arbor, Mich. Inspection and Maintenance Staff.
ANALYSIS OF THE EMISSION INSPECTION ANALYZER
William B. Clemmens Sep. 1980 66 p refs
(PB81-153496; EPA-AA-IMS-80-5-A) Avail: NTIS HC A04/MF A01 CSCL 13B

Recently there has been more emphasis on checking the performance of in-use vehicles. This is occurring through the implementation of state inspection and maintenance (1M) programs. Various state and trade associations have developed standards to control the quality of the equipment used but there are no nationally accepted minimum standards for inspection analyzers. An examination of the data validity issue encompasses two questions: is the data generated under present conditions sufficiently valid; and is there a need for minimum quality standards for inspection analyzers. GRA

N81-25597# SRI International Corp., Menlo Park, Calif.
STUDY OF THE ADEQUACY OF AIR MONITORING. PART 2: INHALABLE PARTICULATES
Robert M. Patterson, Leonard A. Cavanagh, and Ronald E. Ruff Dec. 1980 121 p refs Sponsored by National Commission on Air Quality
(PB81-150880; AQ-7405-8E-Pt-2) Avail: NTIS HC A06/MF A01 CSCL 13B

The need for future monitoring, and the status of a National Ambient Air Quality Standards for inhalable particulates are discussed. The extent of the data base available on particulates, the quality of current monitoring techniques, a size specific standard for particulates, and possible effects of a standard were examined. GRA

N81-25598# Pacific Environmental Services, Inc., Elmhurst, Ill.
STUDY OF THE 1979 STATE IMPLEMENTATION PLAN SUBMITTALS. AN OVERVIEW OF THE SIP REVIEW PROCESS AT THE STATE LEVEL AND THE SIPS FOR PARTICULATE MATTER, SULFUR DIOXIDE AND OZONE Final Report
Indur Goklany, Vinod Bhatia, and Thomas Blaszak Dec. 1980 315 p Revised
(Contract NCAQ-3A-AQ-7353)
(PB81-150864; AQ-7353-3A-Rev) Avail: NTIS HC A14/MF A01 CSCL 13B

A technical overview of the state implementation plan (SIP) development process is presented. The adequacy of the emission

inventory, ambient air monitoring, and meteorological data bases are evaluated. The SIP development processes for total suspended particulates, sulfur dioxide, and photochemical oxidants are investigated. GRA

N81-25599# Charles County Community Coll., La Plata, Md.
FIELD STUDY OF NUTRIENT CONTROL IN A MULTICELL LAGOON Final Report, Jul. 1975 - Feb. 1980
William T. Engel and Thomas T. Schwing Aug. 1980 84 p refs
(Grant EPA-R-803637)
(PB81-148348; EPA-600/2-80-155) Avail: NTIS HC A05/MF A01 CSCL 13B

Nutrient control in a serially arranged, multicell aerated lagoon system over a three year period is described. Reliable technology for reducing phosphorus and converting ammonia-nitrogen to nitrate-nitrogen was developed. A six-cell lagoon was modified into two independent three-cell systems. One system was maintained as a control and the other was the test system used for nutrient control. Alum was added to the third cell of the test system. Another test was conducted with alum being fed to the first cell. The alum addition in the third cell was more effective in reducing phosphorus. A plastic media tower was added after the third cell in the test system for nitrification of ammonia-nitrogen. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N81-25600# Academy of Sciences (USSR), Moscow. Space Research Inst.
EXPERIMENTS WITH INJECTION OF POWERFUL PLASMA JET INTO THE IONOSPHERE
R. Z. Sagdeev, G. G. Managadze, A. A. Martinson, Yu. A. Romanovsky, R. I. Moisya, W. K. Piedler, M. F. Friedrich, T. G. Adeishvily, S. B. Lyakhov, L. S. Novikov et al 1980 26 p refs
(Rept-294) Copyright. Avail: Issuing Activity

The peculiarities of the structure and dynamics of powerful plasma jets as well as perturbations of the electrical and magnetic fields due to plasma injection were studied. The injection of the jets was performed from the MR-12 rocket at heights of 100 to 145 km. A stationary plasma accelerator was used as the plasma injector. T.M.

N81-25601# Academy of Sciences (USSR), Moscow. Space Research Inst.
THE MAGNETOSPHERE BOUNDARY PHENOMENA AND THE POLAR CAP CONVECTION
E. M. Dubinin and Yu. N. Potanin 1980 14 p refs
(Rept-293) Copyright. Avail: Issuing Activity

The study of convection in the artificial magnetosphere polar cap for the northern magnetic field component in the plasma flow showed that the dimension and position of new convectional cells caused by the magnetic field reconnection processes at the magnetosphere boundary greatly depend on the value of B sub z. For small values of B sub z < 0 those convectional cells are localized in the region adjacent to the noon. As the field increases the dimension of these cells increases with the sunward convection in the polar cap central part, and they gradually fill the whole cap. In accordance with this the high-latitude boundary layer (mantle) structure changes. In the outer mantle region the circulation picture is determined by convectional motions excited as a result of reconnection. T.M.

N81-25602*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TRANSPORT OF INFRARED RADIATION IN CUBOIDAL CLOUDS
Harshvardhan (Maryland Univ., College Park), James A. Weinman (Wisconsin Univ., Madison), and Roger Davies (Purdue Univ.) Apr. 1981 49 p refs Submitted for publication
(Grants NsG-5209; NAG5-101)
(NASA-TM-82116) Avail: NTIS HC A03/MF A01 CSCL 04A

The transport of infrared radiation in a single cuboidal cloud using a vertical two steam approximation was modeled. The emittance of the top face of the model cloud is always less than that for a plane parallel cloud of the same optical depth. The hemisphere flux escaping from the cloud top has a gradient from the center to the edges which brighten when the cloud is over warmer ground. Cooling rate claculations in the 8 to 13.6 micrometer region show that there is cooling from the sides of the cloud at all levels even when there is heating of the core from the ground below. The radiances exiting from model cuboidal clouds were computed by path integration over the source function obtained with the two stream approximation. It is suggested that the brightness temperature measured from finite clouds will overestimate the cloud top temperature. E.A.K.

N81-25603*# Ohio State Univ., Columbus. Dept. of Geodetic Science.
ELLIPSOIDAL CORRECTIONS FOR GEOID UNDULATION COMPUTATIONS
Richard H. Rapp Mar. 1981 25 p refs
(Grant NGR-36-008-161; OSURF Proj. 783210)
(NASA-CR-164440; Rept-308) Avail: NTIS HC A02/MF A01 CSCL 08E

The computation of accurate geoid undulations is usually done combining potential coefficient information and terrestrial gravity data in a cap surrounding the computation point. In doing this a spherical approximation is made that can cause the errors that were investigated. The equations dealing with ellipsoidal corrections developed by Lelgemann and by Moritz were used to develop a computational procedure considering the ellipsoid as a reference surface. Terms in the resulting expression for the geoid undulation are identified as ellipsoidal correction terms. These equations were developed for the case where the Stokes function is used, and for the case where the modified Stokes function is used. For a cap of 20 deg the correction can reach -33 cm. T.M.

N81-25604*# National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, Va.
ECC OZONESONDE PERFORMANCE AT HIGH ALTITUDES: PUMP EFFICIENCY
Arnold L. Torres May 1981 10 p refs
(NASA-TM-73290) Avail: NTIS HC A02/MF A01 CSCL 04A

The ECC ozonesonde sampling behavior was examined at pressures ranging from 80 to 6 hPa with the objective of evaluating uncertainties in high altitude ozone data caused by variations in pumping efficiency. The averaged pump efficiency correction curve for a 43 sample set of 3A type ECC pumps showed a 2-3% bias from the curve provided by the manufacturer. In addition, random pump to pump variations (2 sigma) + or - were 5% at 6 hPa. These values probably represent minimum errors since the pumps were from the same production batch. A seven sample set of the newer 4A type ECC pumps was examined, with similar findings as for the 3A types. T.M.

N81-25605*# Alabama Univ., Huntsville.
STUDIES CONDUCTED AS A SEARCH FOR PHYSICAL MECHANISMS RELATING SOLAR VARIABILITY AND THE TROPOSPHERE Final Report
S. T. Wu, ed. Apr. 1981 279 p refs
(Contract NAS8-33443)
(NASA-CR-161762) Avail: NTIS HC A13/MF A01 CSCL 04A

Chains of causative mechanisms that are hypothesized to relate solar variability to the behavior of the Earth's lower atmosphere were assessed. Solar variations believed most likely to constitute the forcing functions in hypothesized solar terrestrial atmosphere chain, changes in the Earth's atmospheric electrical characteristics due to solar variability, and the observed variations in atmospheric behavior that are influenced by solar variability were also examined. J.M.S.

N81-25606# Finnish Meteorological Inst., Helsinki.
OBSERVATIONS OF RADIOACTIVITY, NO. 19, 1979

1980 68 p refs In FINNISH and ENGLISH
(ISBN-951-697-142-3; ISSN-0071-5220) Avail: NTIS HC A04/MF A01

Measurements of radionuclides in the air and rainwater are reported including short lived beta activity measured in aerosols and long lived beta activity in the ground level aerosol. Tables show the fraction of aerosol beta activity that decays within 4 hours, as well as the fraction that remains five days after the end of the sampling period. Measurements of beta activity is precipitation and settled dust collected in Helsinki and Ivalo are included. A.R.H.

N81-25607*# New York Univ., N. Y.
INTEGRATED AND SPECTRAL ENERGETICS OF THE GLAS GENERAL CIRCULATION MODEL
Joel Tenenbaum 1981 52 p refs Submitted for publication
(Grant NsG-5077)
(NASA-CR-166673) Avail: NTIS HC A01/MF A01 CSCL 04A

Integrated and spectral error energetics of the Goddard Laboratory for Atmospheric Sciences (GLAS) general circulation model are compared with observations for periods in January 1975, 1976, and 1977. For two cases the model shows significant skill in predicting integrated energetics quantities out to two weeks, and for all three cases, the integrated monthly mean energetics show qualitative improvements over previous versions of the model in eddy kinetic energy and barotropic conversions. Fundamental difficulties remain with leakage of energy to the stratospheric level. General circulation model spectral energetics predictions are compared with the corresponding observational spectra on a day by day basis. Eddy kinetic energy can be correct while significant errors occur in the kinetic energy of wavenumber three. Single wavenumber dominance in eddy kinetic energy and the correlation of spectral kinetic and potential energy are demonstrated. Author

N81-25608*# Operations Research, Inc., Silver Spring, Md.
MULTISPECTRAL RESOURCE SAMPLER (MPS): PROOF OF CONCEPT. LITERATURE SURVEY OF ATMOSPHERIC CORRECTIONS
Robert A. Schowengerdt (Arizona Univ., Tucson) and Phillip N. Slater (Arizona Univ., Tucson) 1981 58 p refs 5 Vol.
(Contract NAS5-25606)
(NASA-CR-166670) Avail: NTIS HC A04/MF A01 CSCL 04A

Work done in combining spectral bands to reduce atmospheric effects on spectral signatures is described. The development of atmospheric models and their use with ground and aerial measurements in correcting spectral signatures is reviewed. An overview of studies of atmospheric effects on the accuracy of scene classification is provided. S.F.

N81-25609# Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
THE CREEP OF FROZEN SANDS: QUALITATIVE AND QUANTITATIVE MODELS, PART 2 Final Report, Feb. 1979 -Mar. 1981
John M. Ting Mar. 1981 435 p refs
(Contract DAAG29-77-C-0016)
(AD-A097668; RR-R81-5-Pt-2; ON-692-Pt-2;
ARO-14725.2-G5-Pt-2) Avail: NTIS HC A19/MF A01 CSCL 08/13

Various physical mechanisms controlling the behavior of frozen soil are proposed: ice strength, soil strength, and mechanical interaction through structural hindrance and dilatancy effects. The nature of the linear relationship between the logarithm of the minimum creep rate and the logarithm of the time to minimum observed creep tests on ice, soil, and frozen soil is shown to be due to the existence of an approximately constant strain at the minimum, and the relative insensitivity of this log-log plot to small deviations from a constant value of strain. T.M.

N81-25610# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
MILLIMETER WAVE ATMOSPHERIC OBSERVATIONS Final Report, 1 Aug. 1978 - 16 Jun. 1980
J. H. Rainwater and J. J. Gallagher 27 Mar. 1981 261 p refs
(Contract N00173-78-C-0165)
(AD-A098636; GIT-EES-A-2173) Avail: NTIS HC A12/MF A01 CSCL 04/1

Observations of atmospheric emission were performed at 94 GHz during a period of inclement weather in February/March, 1980. The measurements were made at the Engineering Experiment Station at Georgia Tech and were limited to zenith observations. The radiometer which was employed has been described in previous reports. Theoretical aspects of fluctuation effects are described. The observations were performed for an integration time of 0.16 seconds so that the change of minimum temperature was in the range from approximately 0.8 K to 1.2 K. The observed sky emission resulted in brightness temperatures approximately an order of magnitude larger than the change of minimum temperature and exceeds the theoretical sky temperature values. GRA

N81-25611# Purdue Univ., Lafayette, Ind. Dept. of Geosciences.
SYNTHETIC SEISMOGRAM MODELING Technical Report, 1 Dec. 1979 - 30 Nov. 1980
Lawrence W. Braile 5 Feb. 1981 24 p refs
(Contract N00014-75-C-0972)
(AD-A095271; TR-1-81-ONR) Avail: NTIS HC A02/MF A01 CSCL 08/11

Applications of synthetic seismogram modeling are the subject of two papers which have been or will be shortly published and which are reproduced in this report. Reflectivity method synthetic seismogram calculation utilizing a modified reflectivity code incorporating correct treatment of the free surface, non-zero depth of burial of the source, anelasticity (Q-1) of the layered medium and realistic sources results in a useful modeling procedure which is capable of application to complex real-data situations. The results of calculations for continental crustal and upper mantle structures yields information on the velocity and Q structure of the upper mantle and the wave propagation characteristics of several phase types including head waves, (such as P sub n), guided wave phases (P and L sub g) and wide angle reflections. GRA

N81-25612# National Bureau of Standards, Boulder, Colo.
A STUDY OF CLUSTERING IN WATER VAPOR AT ULTRAVIOLET WAVELENGTHS Final Report, 1 Dec. 1979 - 1 Nov. 1980
J. C. Wyss, R. E. Drullinger, E. W. Smith, and J. Copper 10 Apr. 1981 17 p refs
(Contract MIPR-ARO-13-80)
(AD-A098696; ARO-16899.1-P) Avail: NTIS HC A02/MF A01 CSCL 04/1

A device for measuring clusters in water vapor was constructed based on vacuum ultraviolet absorption techniques. Four absorption cells were built with sapphire windows to provide paths lengths of 5.0, 11.0, 76.2, and 284.5 mm. Each cell was held at a constant temperature (180 C), while the water vapor pressure was varied from 4 - 400 kPa (30 - 3000 Torr). At each pressure, an extinction coefficient was determined by measuring the differential absorption between two cells which were identical except for path length. The ultraviolet light (150 -175 nm) was produced using a xenon, 15 kPa continuum lamp and was wavelength selected using an evacuated 1/4 meter spectrometer. The measured extinction coefficient is observed to have a water vapor density dependence stronger than linear, which may indicate the presence of clusters. Further refinements in the experimental apparatus will be necessary to provide definitive evidence for clustering of water vapor. Author (GRA)

N81-25613# Teledyne Geotechnical, Alexandria, Va. Seismic Data Analysis Center.
SEISMIC RESEARCH Semiannual Technical Summary
Alexandria, Va. VELA Seismological Center May 1980 72 p refs
(Contract F08606-79-C-0007; ARPA Order 2557)
(AD-A098756; SDAC-TR-80-5; VSC-TR-81-5) Avail: NTIS HC A04/MF A01 CSCL 08/11

Contents: Propagation in Shields; Effect of Crustal Structure; Site Effects on Regional Phases; Phase Velocity Versus Depth Studies; Scattering and Q Effects; Amplitude-Distance Re-

lationships for Regional Phases Based on Analysis of Soviet Data; and Detection of Regional Phases. GRA

N81-25614# Air Force Geophysics Lab., Hanscom AFB, Mass. Terrestrial Sciences Div.
SEISMIC HAZARDS STUDIES FOR MINUTEMAN MISSILE WINGS Final Scientific Report
James C. Battis 9 Sep. 1980 74 p refs
(AF Proj. 7600)
(AD-A096720; AFGL-TR-80-0293; AFGL-AFSG-431) Avail: NTIS HC A04/MF A01 CSCL 16/4

The wings are located at Malstrom, Ellsworth, Minot, Whiteman, F.E. Warren, and Grand Forks Air Force Bases. For each site, estimates of the site intensity, acceleration, velocity, and displacement annual risk curves were made based on the historical seismicity within 1000 km of each site. Based on these curves, composite design response spectra for 10-, 100-, and 1000-year return period motions were calculated. Plots of the reported earthquake epicenters near each site were also generated. A method for regional modification of peak acceleration attenuation functions was developed and is presented. T.M.

N81-25615# Utah Univ., Salt Lake City. Earth Science Lab.
GEOPHYSICAL INVESTIGATIONS OF THE BALTAZOR HOT SPRINGS KNOWN GEOTHERMAL RESOURCE AREA AND THE PAINTED HILLS THERMAL AREA, HUMBOLDT COUNTY, NEVADA
R. K. Edquist Feb. 1981 101 p refs
(Contract DE-AC07-79ID-12079)
(DOE/ID-12079/29; ESL-54) Avail: NTIS HC A06/MF A01

Geophysical investigations of the Baltazor Hot Springs geothermal resource area and the Painted Hills thermal area, Humboldt Co., Nevada are described. A gravity survey of 284 stations covering 750 sq km was conducted. Numerical modeling and interpretation of five detailed gravity profiles, numerical modeling and interpretation of 21.8 line km of dipole-dipole electrical resistivity data along four profiles, and a qualitative interpretation of 38 line km of self-potential data along eight profiles are included. The primary purpose of the investigation is to try to determine the nature of the geologic controls of the thermal anomalies at the two areas. DOE

N81-25616# Utah Univ., Salt Lake City. Earth Science Lab.
TERRAIN CORRECTION PROGRAM FOR GRAVITY DATA: USER'S GUIDE AND DOCUMENTATION FOR REV. 0
Laura F. Serpa and Kenneth L. Cook Jan. 1981 12 p refs
(Contracts DE-AC07-79ID-12079; DE-AC07-78ET-28392; Grant DI-14-08-0001-G-533)
(DOE/ID-12079/26) Avail: NTIS HC A02/MF A01

The user's guide and documentation for the TERRAIN computer program are presented. The TERRAIN correction program accesses gravity data to create terrain maps digitized at 30 seconds, one minute, and three minutes of arc intervals of the area of terrain being corrected. A program description and a sample execution of the program are presented. J.D.H.

N81-25617# Los Alamos Scientific Lab., N. Mex.
GEOPHYSICAL STUDY OF THE CRUST AND UPPER MANTLE BENEATH THE CENTRAL RIO GRANDE RIFT AND ADJACENT GREAT PLAINS AND COLORADO PLATEAU
Mark E. Ander Mar. 1981 235 p refs
(Contract W-7405-eng-36)
(LA-8676-T) Avail: NTIS HC A11/MF A01

As part of the national hot dry rock (HDR) geothermal program, a regional deep magnetotelluric (MT) survey of Arizona and New Mexico was performed. A regional geoelectric contour map was produced of the pervasive deep electrical conductor within the crust/or upper mantle beneath the Colorado Plateau, Basin and Range Province, and Rio Grande rift. An MT/audiomagnetotelluric (AMT) study of a 161 km(2) HDR prospect was performed on the Zuni Indian Reservation, New Mexico. Two dimensional gravity modeling of a 700 km gravity profile at 34030 N latitude was used to study the crust and upper mantle beneath the Rio Grande rift. . DOE

N81-25618# Geological Survey, Reston, Va.
SAMPLE PREPARATION OF X-RAY DIFFRACTION ANALYSIS AND CLAY MINERALOGY
John W. Hosterman and Patricia Loferski Mar. 1981 9 p refs
(Contracts DE-AI01-76ET-10136; EX-76-C-01-2287)
(DOE/METC-2287/112) Avail: NTIS HC A02/MF A01

Three well known methods of preparing the clay fraction for X-ray diffraction analysis were tested and evaluated. Kaolinite was not identified in samples prepared by the two settling methods because of layering due to differing/settling rates of the clay minerals. It is suggested that if one of the two settling methods of sample preparation is used that the clay film should be thin enough for the X-ray beam to penetrate the entire thickness of clay. The vacuum method of sample preparation is preferred. Chlorite, kaolinite, 2 M illite (muscovite), and mixed layer are the clay minerals found by X-ray diffraction analysis in Devonian shale of the Appalachian basin. The proportions of mixed layer clay minerals were determined by comparing areas of selected basal peaks on X-ray diffraction traces of untreated samples with those of samples that had been heated and saturated by ethylene glycol. DOE

N81-25619# Pennsylvania Dept. of Environmental Resources, Harrisburg. Bureau of Topographic and Geologic Survey.
STRATIGRAPHIC CROSS SECTION (1) OF THE UPPER DEVONIAN PERRYSBURG AND JAVA FORMATIONS AND THEIR EQUIVALENTS, NORTHWESTERN PENNSYLVANIA
J. A. Harper and K. D. Abel 1981 25 p refs
(Contract DE-AS21-76MC-05198)
(METC/EGSP-22) Avail: NTIS HC A02/MF A01

A map of the Java, Perrysburg, Ohio shale and Olentagy shale formations in the Erie, Crawford, Warren, Forest, and Clarion counties of Pennsylvania is presented. The stratigraphic cross section is based on gamma ray logs. Special emphasis is placed on the organic rich, radioactive shales of these formations. DOE

N81-25620# Los Alamos Scientific Lab., N. Mex.
EARTHQUAKE CATALOG FOR NORTHERN NEW MEXICO Progress Report, Oct. - Dec. 1980
D. J. Wechsler, D. J. Cash, K. H. Olsen, N. J. McFarland, and J. J. Wolff Feb. 1981 18 p refs
(Contract W-7405-eng-36)
(LA-8745-PR) Avail: NTIS HC A02/MF A01

The earthquakes in northern New Mexico located by the Los Alamos National Laboratory seismic array are summarized. Data are presented in the form of tables and epicenter maps, with a brief explanatory text. DOE

N81-25621# California Univ., Berkeley. Earthquake Engineering Research Center.
SIMULATING AND ANALYZING ARTIFICIAL NON-STATIONARY EARTHQUAKE GROUND MOTIONS
Robert F. Nau, Robert M. Oliver, and Karl S. Pister Oct. 1980 69 p refs
(PB81-153397; UCB/EERC-80/36) Avail: NTIS HC A04/MF A01 CSCL 08K

Models used to simulate earthquake accelerograms are described and analyses of these artificial accelerogram records for use in structural response studies are presented. The artificial accelerogram records are generated by a class of linear difference equations which was previously identified as suitable for describing strong ground motions. The major contributions are the use of Kalman filters for estimating time-varying model parameters, and the development of an effective non-parametric method for estimating the variance envelopes of the accelerogram records. GRA

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N81-25622 Colorado State Univ., Fort Collins.
A TURBULENCE MODEL FOR TORNADO-LIKE SWIRLING FLOWS Ph.D. Thesis
Samir Sobhy Ayad 1980 96 p
Avail: Univ. Microfilms Order No. 8110792

To obtain a better understanding of the interaction of a tornado with the ground, a numerical model of the central region of an axisymmetrical vortex near the ground is considered. With the object of obtaining a detailed description of mean values of wind velocity and pressures, two transport equations for the kinetic energy of turbulence k and its rate of dissipation epsilon are solved simultaneouly with the set of basic equations of continuity, momentum and energy. A staggered mesh on a stretched coordinante system is used. The momentum equations are solved in their primitive form and an iterative solution for the pressure is obtained such that the velocity divergence vanishes everywhere. Dissert. Abstr.

N81-25623 Colorado State Univ., Fort Collins.
THE ROLE OF CONVECTIVE-SCALE PROCESSES IN TROPICAL CYCLONE DEVELOPMENT Ph.D. Thesis
James Joseph Hack, Jr. 1980 213 p
Avail: Univ. Microfilms Order No. 8110808

An eighteen level axisymmetric primitive equation tropical cyclone model which incorporates the Arakawa-Schuber (1974) spectral cumulus parameterization is presented. The quasi-equilibrium hypothesis, which involves the solution of an integral equation for the cloud base mass flux distribution, is successfully formulated as an optimization problem to guarantee a nonnegative solution. A linear analysis suggests that in the tropics a large fraction of the available potential energy generated by the release of latent heat is partitioned to gravity inertia wave motion and hence is radiated away to the far field. Therefore, an approximate pure gravity wave radiation boundary condition is derived which minimizes the reflection of gravity inertia waves by the lateral boundary of the model. Dissert. Abstr.

N81-25624# Hawaii Univ., Honolulu. Dept. of Meteorology.
FORECASTING TYPHOON MOVEMENT BASED ON SATELLITE CLOUD MAPS
Bao Cheng-lan Mar. 1981 41 p refs
(UHMET-81-03) Avail: NTIS HC A03/MF A01

The cloud pattern characteristics of a typhoon and their relationship with cloud patterns of the environmental flow field are used to deduce subsequent typhoon movement. When the cloud systems of typhoon and environment maintain their shapes for several consecutive days, the typhoon moves steadily along an almost linear track. When the typhoon and environmental cloud systems change suddenly and significantly, a major turning in the typhoon track will be observed 12 to 48 hr later. Within the internal cloud features of the typhoon, the formation and position of a significant Cb cloud cluster (SCCC) and the orientation and development of a bright center (or tongue) in the brightness field are the most important indicators for the future direction of the typhoon within 12 to 36 hr. To test these concepts, a 16 point compass system was used to evaluate the errors in 54 forecasts for 6 typhoons in summer 1980. If the grade 0-1 of forecast errors is considered as correct, accuracy in 88.9 percent for 12 hr forecasts and 81.5 percent for 24 hr forecasts. Author

N81-25625*# Rice Univ., Houston, Tex.
LIGHTNING DETECTION FROM SPACE SCIENCE AND *APPLICATIONS TEAM REVIEW* Final Report
Arthur A. Few, Jr. Apr. 1981 19 p refs
(Contract NAS8-33715)
(NASA-CR-161794) Avail: NTIS HC A02/MF A01 CSCL 04B

The various needs for lightning data that exist among potential users of satellite lightning data were identified and systems were defined which utilize the optical and radio frequency radiations from lightning to serve as the satellite based lightning mapper. Three teams worked interactively with NASA to develop a system concept. An assessment of the results may be summarized as follows: (1) a small sensor system can be easily designed to operate on a geostationary satellite that can provide the bulk of the real time user requirements; (2) radio frequency systems in space may be feasible but would be much larger and more costly; RF technology for this problem lags the optical technology by years; and (3) a hybrid approach (optical in space and RF on the ground) would provide the most complete information but is probably unreasonably complex and costly at this time. A.R.H.

N81-25626*# Computer Sciences Corp., Huntsville, Ala.
SUMMARY OF JIMSONDE TEMPERATURE PROFILES. PART 2: PROGRAMS, DATA COMMENTS Final Report
Joseph A. Willett 1 Mar. 1981 30 p
(Contract NAS8-32432)
(NASA-CR-161776) Avail: NTIS HC A03/MF A01 CSCL 04B

Natural environment criteria are established and interpreted for aeronautical vehicle design and engineering operations. Data summaries, computer formats, frequency distributions, and composite listings of the temperature profiles acquisition program are included. R.C.T.

N81-25627*# City Univ. of New York, N. Y.
SUMMARY OF RESULTS OF JANUARY CLIMATE SIMULATIONS WITH THE GISS COARSE-MESH MODEL
J. Spar, C. Cohen, and P. Wu Jun. 1981 12 p refs
(Grant NGR-33-016-086)
Avail: NTIS HC A02/MF A01 CSCL 04B

The large scale climates generated by extended runs of the model are relatively independent of the initial atmospheric conditions, if the first few months of each simulation are discarded. The perpetual January simulations with a specified SST field produced excessive snow accumulation over the continents of the Northern Hemisphere. Mass exchanges between the cold (warm) continents and the warm (cold) adjacent oceans produced significant surface pressure changes over the oceans as well as over the land. The effect of terrain and terrain elevation on the amount of precipitation was examined. The evaporation of continental moisture was calculated to cause large increases in precipitation over the continents. T.M.

N81-25628# Finnish Meteorological Inst., Helsinki.
METEOROLOGICAL YEARBOOK OF FINLAND, VOLUME 79, PART 1a, 1979. CLIMATOLOGICAL DATA, 1979
1980 115 p refs In FINNISH and ENGLISH
(ISBN-951-697-144-X; ISSN-0076-6747) Avail: NTIS HC A06/MF A01

Daily observations from 12 stations and monthly and annual summaries from 156 stations are presented. The processing of climatic data was done on a Datasaab D 22. Information required for calculating the summaries for synoptic stations was extracted directly from the teleprinter messages received on paper tape. The data include: air temperatures, daily mean temperatures, precipitation, air pressure, wind variations, cloud cover, and relative humidity. T.M.

N81-25629# Finnish Meteorological Inst., Helsinki.
OBSERVATIONS OF ATMOSPHERIC ELECTRICITY, NO. 1, 1977-1979
1980 90 p refs
(ISBN-951-697-141-5; ISSN-0358-2671) Avail: NTIS HC A05/MF A01

The following tables show the four measured quantities and the calculated omega for the fair weather hours. The short circuits caused by spiderthreads are most frequent in autumn, especially at night when the relative humidity is high. Flying insects and dust blocked gradually the metal grids in front of the conductivity meter inlets during June-August 1978 and June 1979. In order to save as much fair weather data as possible, a correction was made to the conductivity during these months. The correction is necessarily approximate, but the errors are insignificant in long period statistics. The correction to the conductivity was made by assuming that the decrease of measured conductivity was linear with time, beginning on 1st June each year. The rate of decrease was deduced from the behavior of omega and, in 1979, from the difference of measured conductivity before and after cleaning the inlets. In August and late July 1978 the blocking was so serious that the correction was considered too inaccurate, and that period has been omitted. J.M.S.

N81-25630# Finnish Meteorological Inst., Helsinki.
METEOROLOGICAL YEARBOOK OF FINLAND, VOLUME 75, PART 1b, 1975. CLIMATOLOGICAL DATA FROM JOKIONEN AND SODANKYLAE OBSERVATORIES, 1975
1980 51 p refs In FINNISH and ENGLISH
(ISBN-951-697-145-8; ISSN-0076-6739) Avail: NTIS HC A04/MF A01

The meteorological data include: the recorded momentary values of the atmospheric pressure; temperature and relative humidity at even hours; the hourly mean values of the wind direction and wind speed; momentary observations of the total cloud cover; the forms of clouds and the height of the cloud base; meteors observed with time of appearance; and the observation of precipitation, visibility and snow depth. All times referred to in the tables are stated in local standard time. T.M.

N81-25631*# Wisconsin Univ. - Madison. Space Science and Engineering Center.

A STUDY OF THE ECONOMIC BENEFITS OF METEOROLOGICAL SATELLITE DATA Final Report

David Suchman, Brian A. Auvine, and Barry H. Hinton Sep. 1980 260 p refs

(Contract NAS5-23706)

(NASA-CR-166663) Avail: NTIS HC A12/MF A01 CSCL 04B

Satellite data, while most useful in data poor areas, serves to fine tune forecasts in data rich areas. It consequently has a resulting significant economic benefit because, as previously stated, even one improved forecast per client per year can save each client thousands of dollars. Multiply this by several hundred clients and the dollar savings are sizeable. The great educational value which experience with satellite data gives undoubtedly leads to improved forecasts. Any type of future satellite data delivery system should take into account the needs and facilities of the user community to make it most useful.

J.M.S.

N81-25632# Naval Oceanography Command Detachment, Asheville, N.C.

SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS (SSMO), CENTRAL AMERICAN COASTAL MARINE AREAS, WEST COAST. VOLUME 2, AREA 6 - MANZANILLO SE, AREA 7 - ACAPULCO SOUTH, AREA 8 - GULF OF TEHUANTEPEC, AREA 9 - GUATEMALA SW COAST, AREA 10 - NICARAGUA SW COAST, AREA 11 - PUNTA BURICA

Feb. 1981 485 p

(AD-A097707) Avail: NTIS HC A21/MF A01 CSCL 04/2

This report presents marine climatological data for specific coastal areas in 21 different tables including weather occurrence, wind direction and speed, cloud amount, ceiling height, visibility, precipitation, dry bulb, relative humidity, air-sea temperature difference, sea height and period, sea surface temperature and sea level pressure. Author (GRA)

N81-25633# Naval Environmental Prediction Research Facility, Monterey, Calif.

AN AUTOMATIC CLOUD TRACKING SYSTEM BASED ON THE CROSS-VARIANCE METHOD Final Report

David H. Lee and Roland E. Nagle Dec. 1980 63 p refs

(WF52551792)

(AD-A098124; NEPRF-TR-80-08) Avail: NTIS HC A04/MF A01 CSCL 04/2

An automatic cloud tracking system based on the computation of the cross-covariance between satellite images has been developed. The six steps of the System for Automatic Wind Extraction from Geostationary Satellite-Data (SAWEGS) are preprocessing, cloud tracking, height assignment, Earth location, wind vector computation, and quality control. The system embodies various unique aspects developed to address the problems encountered with an automated technique in general and this technique in particular. These aspects include histogram-based temperature slicing, cloud edge and surface enhancement, tracking trackability tests, and use of numerical analysis temperature profiles for height assignment. Examples of applying SAWEGS to visible data, to infrared data, and to a difficult tropical cyclone case show the good quality and coverage of resulting vectors as well as the remaining difficulties.

Author (GRA)

N81-25634# JAYCOR, Alexandria, Va.

DEVELOPMENT OF A PBL PARAMETERIZATION SCHEME FOR THE TROPICAL CYCLONE MODEL AND AN IMPROVED MAGNETOSPHERIC MODEL FOR MAGIC Final Report, 7 Sep. 1979 - 8 Sep. 1980

Simon Wei-Jen Chang and C. Agritellis 25 Mar. 1981 119 p refs

(Contract N00173-79-C-0465)

(AD-A098635; JAYCOR-PSD-200-81-004FR) Avail: NTIS HC A06/MF A01 CSCL 04/2

Contents: The Impact of Satellite-Sensed Winds On Intensity Forecasts of Tropical Cyclones; Numerical Simulation of the Influence of Sea-Surface Temperature of Translating Tropical Cyclones; Test of a Planetary Boundary Layer Parameterization Based on a Generalized Similarity Theory In Tropical Cyclone Models. GRA

N81-25635# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

GRAY AAF, FORT HOOD, TEXAS. REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F Final Report

13 Jan. 1981 464 p refs

(AD-A098611; AD-E850043; USAFETAC/DS-81/028) Avail: NTIS HC A20/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Gray AAF, Ft. Hood, Texas. It contains the following parts: (A) weather conditions, atmospheric phenomena; (B) precipitation, snowfall and snow depth (daily amounts and extreme values); (C) surface winds; (D) ceiling versus visibility, sky cover; (E) psychrometric summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet-bulb and dew point temperatures and relative humidity); and (F) pressure summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N81-25636# Virginia Univ., Charlottesville. Dept. of Environmental Sciences.

SPATIAL AND TEMPORAL VARIATIONS IN CYCLONE FREQUENCY PATTERNS

Bruce P. Hayden, Robert Dolan, and William Smith Apr. 1981 120 p refs Rept. from Second Conf. on Coastal Meteorology Conf. held at Los Angeles, 30 Jan. - 1 Feb. 1980

(Contract N00014-81-K-0033)

(AD-A098581; TR-21; TR-22) Avail: NTIS HC A06/MF A01 CSCL 04/2

Contents: Atlantic Coast Extratropical Cyclones: Characteristic Frequency Patterns and their Secular Variation; Season-to-Season Cyclone Frequency Prediction; Secular Variation in Atlantic Coast Extratropical Cyclones; and Cyclone Occurrence Mapping: Equal Area or Raw Frequencies. GRA

N81-25637# Weather Wing (5th), Langley AFB, Va.

TERMINAL FORECAST REFERENCE NOTEBOOK (TFRN) FOR GEORGE AFB, CALIFORNIA Final Report

4 Sep. 1980 77 p

(AD-A098438; AD-E850038; Rept-5WW/TFRN-80/001) Avail: NTIS HC A05/MF A01 CSCL 04/2

This terminal forecast reference notebook is for George AFB, CA. It describes the following topics concerning forecasting at George AFB: location, topography and local effects; impact of weather on supported units; synoptic meteorology; climatic aids; operationally significant forecast problems; rules of thumb; special synoptic study; and approved forecast studies. A forecasting guide for Cuddeback Range is also included. GRA

N81-25638# Weather Wing (5th), Langley AFB, Va.

TERMINAL FORECAST REFERENCE NOTEBOOK (TFRN) FOR LUKE AFB, ARIZONA Final Report

2 Jun. 1980 99 p

(AD-A098445; AD-E850039; Rept-5WW/TFRN-80/002) Avail: NTIS HC A05/MF A01 CSCL 04/2

This terminal forecast reference notebook is for Luke AFB, Arizona. It describes the following topics concerning forecasting weather at Luke AFB: location, topography, and local effects; impact of weather on supported units; synoptic climatology; climatic aids; operationally significant forecast problems; ap-

proved forecast studies; rules of thumb; and special synoptic studies and references. GRA

N81-25639# Western Scientific Services, Inc., Fort Collins, Colo.
WIND ENERGY RESOURCE ATLAS. VOLUME 2: THE NORTH CENTRAL REGION
D. L. Freeman, D. L. Hadley, D. L. Elliott, W. R. Barchet, and R. L. George Feb. 1981 191 p refs Prepared for Battelle Pacific Northwest Labs.
(Contract DE-AC06-76RL-01830)
(PNL-3195-WERA-2-Vol-2) Avail: NTIS HC A09/MF A01

The North Central atlas assimilates six collections of wind resource data: one for the region and one for each of the five states that compose the North Central region (Iowa, Minnesota, Nebraska, North Dakota, and South Dakota). At the state level, features of the climate, topography and wind resource are discussed in greater detail than is provided in the regional discussion, and that data locations on which the assessment is based are mapped. Variations over several time scales in the wind resource at selected stations in each state are shown on graphs of monthly average and international wind speed and power, and hourly average wind speed for each season. Other graphs present speed direction and duration frequencies of the wind at these locations. DOE

N81-25640# GEOMET, Inc., Gaithersburg, Md.
WIND ENERGY RESOURCE ATLAS. VOLUME 6: THE SOUTHEAST REGION
J. Zabransky, J. M. Vilardo, J. T. Schakenbach, D. L. Elliott, W. R. Barchet, and R. L. George Jan. 1981 175 p refs
(Contract DE-AC06-76RL-01830)
(PNL-3195-WERA-6-Vol-6) Avail: NTIS HC A08/MF A01

The Southeast atlas assimilates six collections of wind resource data: one for the region and one for each of the five states that compose the Southeast region (Alabama, Florida, Georgia, Mississippi, and South Carolina). At the state level, features of the climate, topography and wind resource are discussed in greater detail than is provided in the regional discussion, and the data locations on which the assessment is based are mapped. Variations, over several time scales, in the wind resource at selected stations in each state are shown on graphs of monthly average and interannual wind speed and power, and hourly average wind speed for each season. Other graphs present speed, direction and duration frequencies of the wind at these locations. DOE

N81-25641# Oak Ridge National Lab., Tenn. Environmental Sciences Div.
MOVING BOUNDARY STORM SURGE MODELLING WITH NUMERICAL METHODS
G. T. Yeh and F. K. Chou Apr. 1981 91 p refs
(Contract W-7405-eng-26)
(ORNL-5811; Publ-1523) Avail: NTIS HC A05/MF A01

Time-staggered explicit and alternating-direction implicit finite difference techniques are employed to simulate the storm surge on the vertically integrated hydrodynamic equations of continuity and momentum. Water-land interfaces are treated as moving boundaries. The advancing and retreating of the surge wave over the low-lying dry land and the propagation of the water-land interface are dealt with on the basis of physical and mathematical principles. The complete set of governing equations is applied to the water regime as well as the dry land as soon as it is flooded. Numerical experiments indicate that the moving boundary models predict as much as 30 percent lower surge level at the coastline than do fixed boundary models when the adjacent inland area has a mild slope and the wind is very strong. The moving boundary models yield better agreement with recorded surge. DOE

N81-25642# Aspen Inst. for Humanistic Studies, Boulder, Colo. Div. on Food, Climate and the World's Future.
CLIMATE CHANGE AND SOCIETY: CONSEQUENCES OF INCREASING ATMOSPHERIC CARBON DIOXIDE
William W. Kellogg and Robert Schware 1981 192 p refs
(Contract DE-AC02-79EV-10281)
(DOE/EV-10281/T3) Avail: NTIS HC A09/MF A01

Current knowledge of the causes of climate change is summarized and a scenario of the future climate distribution that could prevail on a warmer Earth is presented. The impacts of climatic change in particular, a global warming accompanied by a shift in rainfall patterns, are considered for such vital areas as food and fiber production, water resources, natural ecological systems, fisheries, health and disease and energy demand. The political, economic, social, and ethical implications of global environmental change are discussed and national and international strategies for mitigating the impacts of climatic change or possibly averting that change altogether are evaluated. DOE

N81-25643# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Environmental Transport Div.
CALCULATION OF PARTICULATE DISPERSION IN A DESIGN-BASIS TORNADIC STORM FROM THE BATTELLE MEMORIAL INSTITUTE, COLUMBUS, OHIO
D. W. Pepper Oct. 1980 24 p refs
(Contract DE-AC09-76SR-00001)
(DP-1583) Avail: NTIS HC A02/MF A01

A three dimensional numerical model is used to calculate ground-level air concentration and deposition (due to precipitation scavenging) after a hypothetical tornado strike. Plutonium particles less than 20 micro m in diameter are assumed to be lifted into the tornadic storm cell by the vortex. The rotational characteristics of the tornadic storm are embedded within the larger meso-scale flow of the storm system. The design-basis translational wind value is based on probabilities associated with existing records of tornado strikes in the vicinity of the plant site. Turbulence exchange coefficients are based on empirical values deduced from experimental data in severe stores and from theoretical assumptions obtained from the literature. DOE

N81-25644# Tetra Tech, Inc., Arlington, Va.
ECONOMIC ANALYSIS OF WIND-POWERED REFRIGERATION COOLING/WATER-HEATING SYSTEMS IN FOOD PROCESSING Final Report
Wendy S. Garling, Marc R. Harper, Lynn Merchant-Geuder, and Michael Welch Mar. 1980 150 p refs
(Contracts DE-A101-76ET-20319; EX-76-A-29-1026)
(DOE/SEA-1109-20401/81-1) Avail: NTIS HC A07/MF A01

Potential applications of wind energy include not only large central turbines that can be utilized by utilities, but also dispersed systems for farms and other applications. These applications include production of hot water for rural sanitation, heating and cooling of rural structures and products, drying agricultural products, and irrigation. Types of processing plants included were meat and poultry, dairy, fruit and vegetable, and aquaculture. DOE

N81-25645# Water and Power Resources Service, Denver, Colo.
PROJECT SKYWATER DATA MANAGEMENT USERS GUIDE. ATMOSPHERIC RESOURCES MANAGEMENT PROGRAM
Gerard E. Klazura Jul. 1980 25 p
(PB81-153371) Avail: NTIS HC A02/MF A01 CSCL 04B

Project Skywater is a comprehensive research program designed to develop additional water supplies by cloud seeding techniques. The history, objectives, philosophy, activities, and responsibilities of data management in support of Project Skywater are described. The influences of data management are discussed in terms of the total program structure which includes contractual requirements; annual work plans; data collection, reduction, and processing; data inventory; and data archival and retrieval. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N81-25646 Delaware Univ., Newark.
SURF BEAT: NUMERICAL AND THEORETICAL ANALYSES Ph.D. Thesis
Jen-Men William Lo 1981 200 p
Avail: Univ. Microfilms Order No. 8109622

Dean's (1965) stream function wave theory was used to estimate the surf beat in water of uniform depth with a virtual

pressure and a virtual vertical velocity which were generated by the first order incoming waves. This method shows better results than those of Longuet-Higgins and Stewart (1962). In deep water, both approaches predict the same results, but in shallow water their predictions appear too high. For the problem of uniform bottom slope, the time average (over the incoming wave period) linear one dimensional equations of motion, and the method of characteristics were used. This procedure accounts for bottom slope (wave reflection) and the transient nature of the problem. A comparison between the numerical results and Munk's (1949) field data show reasonable agreement in a water depth of 20 feet for a bottom slope of 0.02. Dissert. Abstr.

N81-25647*# Science Applications, Inc., McLean, Va.
VARIATIONS IN TRANSPORT DERIVED FROM SATELLITE ALTIMETER DATA OVER THE GULF STREAM
Eugene Molinelli and Richard B. Lambert, Jr. Jan. 1981 54 p refs
(Contract NAS5-25864)
(NASA-CR-166671; SAI-81-278-WA; OPD-TR-80-501-01) Avail: NTIS HC A04/MF A01 CSCL 08C

Variations in total change of sea surface height (delta h) across the Gulf Stream are observed using Seasat radar altimeter data. The sea surface height is related to transport within the stream by a two layer model. Variations in delta h are compared with previously observed changes in transport found to increase with distance downstream. No such increase is apparent since the satellite transports show no significant dependence on distance. Though most discrepancies are less than 50 percent, a few cases differ by about 100 percent and more. Several possible reasons for these discrepancies are advanced, including geoid error, but only two oceanographic contributions to the variability are examined, namely, limitations in the two layer model and meanders in the current. It is concluded that some of the discrepancies could be explained as changes in the density structure not accounted for by the two layer model. J.M.S.

N81-25648# Naval Ocean Systems Center, San Diego, Calif.
OCEAN TECHNOLOGY: A DIGEST, REVISION 1
Feb. 1981 64 p refs
(AD-A098619: NOSC/TD-149-Rev-1) Avail: NTIS HC A04/MF A01 CSCL 13/10

This document presents summaries of projects completed, underway, or in planning within the Naval Ocean Systems Center as of February 1981. It is intended to demonstrate the scope of NOSC's ocean engineering effort and provide specific examples of the Center's capabilities in this area. The projects described exemplify research, development, testing, and evaluation in the following areas: remotely controlled underwater vehicles, manned submersibles and panoramic visibility, launch and recovery of submersibles, pressure-resistant hulls and materials, diver equipment salvage systems, undersea imaging, untethered deep-ocean buoys, stationary floating ocean platforms. Additional projects include study of the effects of ocean submersion on radioisotope power units, application of system integration techniques to the development and deployment of undersea sensor arrays, and provision of engineering support for Fleet units and research and development facilities. Author (GRA)

N81-25649# Skidaway Inst. of Oceanography, Savannah, Ga.
CONTINENTAL SHELF PROCESSES AFFECTING THE OCEANOGRAPHY OF THE SOUTH ATLANTIC BIGHT
Progress Report, 1 Jun. 1980 - 1 Jun. 1981
L. P. Atkinson Feb. 1981 160 p refs
(Contract DE-AS09-76EV-00889)
(DOE/EV-00889/7-Vol-1) Avail: NTIS HC A08/MF A01

Preliminary results of GABEX-1 are presented. The GABEX-1 measurements combined with other observations provide greater understanding of the bight during the spring transition period when the shelf goes from horizontal to vertical stratification. T.M.

N81-25650# Skidaway Inst. of Oceanography, Savannah, Ga.
HYDROGRAPHIC OBSERVATIONS OFF SAVANNAH AND BRUNSWICK, GEORGIA: MARCH, MAY AND SEPTEMBER 1977 AND JANUARY 1978
J. J. Singer, Larry P. Atkinson, W. S. Chandler, and S. S. Bishop 1980 437 p refs
(Contracts DE-AS09-76EV-00889; EY-76-S-09-0889)
(DOE/EV-00889/7-Vol-3; TR-80-1) Avail: NTIS HC A19/MF A01

Research progress is reported in studies of the oceanography of the South Atlantic Bight during the spring transition period. Volume 3 contains technical reports of hydrographic observations. DOE

N81-25651# Skidaway Inst. of Oceanography, Savannah, Ga.
THE GABEX-1 CRUISES: STATION LOSS, STANDARD SECTIONS AND MAPS AND TIME SERIES TRANSECTS
Larry P. Atkinson, James J. Singer, and William S. Chandler 8 Jul. 1980 170 p
(Contract DE-AS09-76EV-00889)
(DOE/EV-00889/7-Vol-2; Rept-1) Avail: NTIS HC A08/MF A01

Examples of standard plots are presented along with information on how to specify desired plots. Station log listings for the EASTWARD and ISELIN cruises are included. T.M.

N81-25652# Dynalysis of Princeton, N.J.
GULF OF MEXICO NUMERICAL MODEL PROJECT SUMMARY
Alan F. Blumberg, George L. Mellor, and H. James Herring Feb. 1981 21 p refs
(Contract DE-AC02-78ET-20612)
(DOE/ET-20612/T1) Avail: NTIS HC A02/MF A01

Realistic boundary conditions and bottom topography were among the refinements made to an existing multidimensional numerical model used to predict the time dependent circulation and temperature distribution in the Gulf of Mexico during the year. Model predictions were compared with observed features of the Gulf. The application of the model in identifying the thermal impact on the environment of operating ocean thermal energy conversion power plants in the Gulf is described. DOE

N81-25653# California Univ., San Diego. Inst. of Marine Resources.
PACIFIC SEAWEED AQUACULTURE, PROCEEDINGS OF A SYMPOSIUM ON USEFUL ALGAE
Isabella A. Abbott, Michael S. Foster, and Louise F. Eklund 1980 230 p refs Conf. held at Pacific Grove, Calif., 6-8 Mar. 1980
(PB81-153942; NOAA-80122303) Avail: NTIS HC A11/MF A01 CSCL 08A

Workers were drawn together to poll information on growing and using seaweeds, particularly in developing countries of the Pacific basin. It is here that many of the world's most useful seaweeds grow and where unemployment is high. GRA

N81-25654# Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
WIND-DRIVEN CIRCULATION IN THE POTOMAC RIVER
Final Report
Dong-Ping Wang (Argonne National Lab.) Dec. 1980 39 p refs
(PB81-148793; PPSP/PPRP-40) Avail: NTIS HC A03/MF A01 CSCL 08C

In a two-year study of the wind-driven circulation in the Potomac River, a field data base and a two dimensional circulation model for the Chesapeake Bay/Potomac River System were developed. Simultaneous current measurements were obtained in winter 1977, in the lower Potomac and at the river-bay junction, to determine the local wind forcing as well as the bay influence. The numerical model includes the features of semi-implicit integration and multiple branches, which allow efficient and flexible simulation of the river-bay circulation. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N81-25655*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
US PLANT AND RADIATION DOSIMETRY EXPERIMENTS FLOWN ON THE SOVIET SATELLITE COSMOS 1129 Final Report

Milton R. Heinrich, ed. and Kenneth A. Souza, ed. May 1981 194 p refs
(NASA-TM-81288; A-8572) Avail: NTIS HC A09/MF A01 CSCL 06C

Experiments included: 30 young male Wistar SPF rats used for wide range physiological studies; experiments with plants, fungi, insects, and mammalian tissue cultures; radiation physics experiments; a heat convection study; a rat embryology experiment in which an attempt was made to breed 2 male and 5 female rats during the flight; and fertile quail eggs used to determine the effects of spaceflight on avian embryogenesis. Specimens for US experiments were initially prepared at the recovery site or in Moscow and transferred to US laboratories for complete analyses. An overview of the mission focusing on preflight, on orbit, and postflight activities pertinent to the fourteen US experiments aboard Cosmos 1129 is presented. T.M.

N81-25656# Colorado Univ. at Boulder. Dept. of Aerospace Engineering Sciences.
MICROWAVE EFFECTS OF LEARNING AND MEMORY IN MICE Final Report
M. W. Luttges 30 Sep. 1980 25 p
(Grant AF-AFOSR-0036-80; AF Proj. 2312)
(AD-A094788; AFOSR-81-0091TR) Avail: NTIS HC A02/MF A01 CSCL 06/18

The effects of microwave irradiation were assessed on learning memory in mice. Also, preliminary studies were completed to begin an assessment of underlying physiological mechanisms related to the observed microwave effects on behavior. Using a resonant microwave irradiation chamber in which mice were exposed following daily training to 3 ghA pulsed microwave at approximately 18 mW/sq cm, small but reliable increases in performance were documented. All treatments were delivered posttrial for a 15 min. period. Repeated replications with different aged animals produced the same effects. The modest facilitation effect was observed when the mice were tested at 20 days after original training. Using a different irradiation chamber, the studies were repeated. The new chamber used an impedance matched horn in which the mice were restrained in a constant orientation relative to the microwave fields. Once again, small but reliable amounts of performance facilitation were observed. GRA

N81-25657# Arizona Univ., Tucson. Dept. of Biochemistry.
DIRECT OBSERVATION OF ELECTRON TRANSFER ACROSS A LIPID BILAYER: LASER PHOTOLYSIS OF AN ASYMMETRIC VESICLE SYSTEM CONTAINING CHLOROPHYLL, METHYL VIOLOGEN, AND EDTA
William E. Ford and Gordon Tollin 1980 14 p refs
(Contract DE-AS02-78ER-04927)
(DOE/ER-04927/T1) Avail: NTIS HC A02/MF A01

Electron transfer was examined to determine the mechanisms of charge transport across the membrane. The discussion is restricted to vesicles whose walls contain phosphatidylcholine, chlorophyll a, and valinomycin.. DOE

N81-25658# Arizona Univ., Tucson. Dept. of Biochemistry.
CHLOROPHYLL-QUINONE PHOTOCHEMISTRY IN LIPOSOMES: MECHANISMS OF RADICAL FORMATION AND DECAY
John K. Hurley and Gordon Tollin 1980 32 p refs
(Contract DE-AS02-78ER-04927)
(DOE/ER-04927/T3) Avail: NTIS HC A03/MF A01

Laser flash photolysis has been used to investigate the mechanism of formation and decay of the radical species generated by light-induced electron transfer from chlorophyll a triplet to quinone in egg phosphatidyl choline bilayer vesicles. Chlorophyll triplet quenching by quinone is controlled by diffusion occurring within the bilayer membrane and reflects bilayer viscosity. Radical formation via separation of the intermediate ion pair is also inhibited by increased bilayer viscosity. Cooperativity is observed in this process due to an enhancement of radical separation by electron transfer from semiquinone anion radical to a neighboring quinone molecule. Two modes of radical decay were observed, a rapid recombination occurring within the bilayer and a much slower recombination occurring across the bilayer. DOE

N81-25659# National Training and Operational Technology Center, Cincinnati, Ohio. Office of Water Program Operations.
BACTERIOLOGICAL METHODS IN WATER QUALITY CONTROL PROGRAMS: INSTRUCTOR'S GUIDE FOR COMPLETING THE COURSE
Rocco Russomanno Sep. 1980 184 p
(PB81-156697; EPA-430/1-80-015) Avail: NTIS HC A09/MF A01 CSCL 06L

A manual designed for use by instructors who teach others how to perform analyses for bacteriological parameters is presented. Topics related to the presentation of training courses in which the analyses is taught. They include: the course description; personnel needed to conduct the training; the course agenda; a milestones list for planning and preparing the course; instructional resources available to support the instruction and a list of equipment and supply requirements. Also included are Instructional Package Worksheets (lesson plans) giving details relative to presenting instruction regarding each of the analyses covered in the associated student reference manual. GRA

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N81-25660* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PROSTHETIC URINARY SPHINCTER Patent
Curtis R. Helms and Harold M. Smyly, inventors (to NASA) Issued 17 Mar. 1981 4 p Filed 12 Oct. 1978 Supersedes N79-14756 (17 - 05, p 0646)
(NASA-Case-MFS-23717-1; US-Patent-4,256,093; US-Patent-Appl-SN-950877; US-Patent-Class-128-1R; US-Patent-Class-128-346; US-Patent-Class-128-Dig.25; US-Patent-Class-137-493) Avail: US Patent and Trademark Office CSCL 06B

A pump/valve unit for controlling the inflation and deflation of a urethral collar in a prosthetic urinary sphincter device is described. A compressible bulb pump defining a reservoir was integrated with a valve unit for implantation. The valve unit includes a movable valve member operable by depression of a flexible portion of the valve unit housing for controlling fluid flow between the reservoir and collar; and a pressure sensing means which operates the valve member to relieve an excess pressure in the collar should too much pressure be applied by the patient.
Official Gazette of the U.S. Patent and Trademark Office

N81-25661* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LOCKING MECHANISM FOR ORTHOPEDIC BRACES Patent
Jireh I. Chao (Howard Univ.) and Charles H. Epps, Jr. (Howard Univ.) Issued 24 Feb. 1981 7 p Filed 20 May 1977 Supersedes N77-27694 (15 - 18, p 2426) Continuation of abandoned US Patent Appl. SN-676958, Filed 14 Apr. 1976 Sponsored by NASA
(NASA-Case-GSC-12082-2; US-Patent-4,252,111; US-Patent-Appl-SN-798976; US-Patent-Appl-SN-676958; US-Patent-Class-128-80F) Avail: US Patent and Trademark Office CSCL 06B

An orthopedic brace locking mechanism is described which under standing or walking conditions cannot be unlocked, however under sitting conditions the mechanism can be simply unlocked so as to permit bending of the patient's knee. Other features of the device include: (1) the mechanism is rendered operable, and inoperable, dependent upon the relative inclination of the brace with respect to the ground; (2) the mechanism is automatically locked under standing or walking conditions and is manually unlocked under sitting conditions; and (3) the mechanism is light in weight and is relatively small in size.
Official Gazette of the U.S. Patent and Trademark Office

N81-25662* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPINE IMMOBILIZATION APPARATUS Patent

Kenneth H. Lambson (Lambson (Kenneth) and Associates) and Hubert C. Vykukal, inventors (to NASA) Issued 14 Apr. 1981 7 p Filed 13 Jul. 1979 Supersedes N79-30921 (17 - 21, p 2865)
(NASA-Case-ARC-11167-1; US-Patent-4,261,349; US-Patent-Appl-SN-057526; US-Patent-Class-128-89R) Avail: US Patent and Trademark Office CSCL 06B

The apparatus makes use of a normally flat, flexible bladder filled with beads or micro-balloons that form a rigid mass when the pressure within the bladder is decreased below ambient through the use of a suction pump so that the bladder can be conformed to the torso of the victim and provide the desired restraint. The bladder is strapped to the victim prior to being rigidified by an arrangement of straps which avoid the stomach area. The bladder is adapted to be secured to a rigid support, i.e., a rescue chair, so as to enable removal of a victim after the bladder has been made rigid. A double sealing connector is used to connect the bladder to the suction pump and a control valve is employed to vary the pressure within the bladder so as to soften and harden the bladder as desired.

Official Gazette of the U.S. Patent and Trademark Office

N81-25663# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
ESTIMATION OF MYODYNAMIC PARAMETER VALUES FROM OBSERVATIONS ON ISOMETRICALLY CONTRACTING MUSCLE GROUPS
H. Hatze May 1980 22 p refs
(CSIR-TWISK-153) Avail: NTIS HC A02/MF A01

A method is presented which makes it possible to estimate from a series of experimental observations of isometric maximum-effort muscle torque, a set of myodynamic parameter values for each of a number of muscles contributing collectively to the total torque output. The parameters that can be estimated are: the individual maximum isometric forces; the spreads of the length tension curves; the relative maximum isometric tendon extension; and the optimum muscle lengths. The method is described for both penniform and fusiform muscles, and is demonstrated using the human triceps muscle as an example. The values obtained by this method are in general agreement with comparable values obtained by in vitro methods. T.M.

N81-25664# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
ANALYSIS OF STRETCH RESPONSES OF A MYOCYBERNETIC MODEL MUSCLE FIBRE
H. Hatze Aug. 1980 14 p refs
(CSIR-TWISK-167) Avail: NTIS HC A02/MF A01

It is found that the model correctly predicts all the peculiar features of the stretch response. The initial rapid force rise; the subsequent slower rise; the slow decay of the force upon termination of the elongation; and the dependence of these phenomena upon stretching velocity and muscle length. The hypothesis explaining these phenomena is discussed in detail.
T.M.

N81-25665*# Massachusetts Inst. of Tech., Cambridge. Dept. of Aeronautics and Astronautics.
HABITUATION TO NOVEL VISUAL VESTIBULAR ENVIRONMENTS WITH SPECIAL REFERENCE TO SPACE FLIGHT Final Report, 1974 - 1980
Laurence R. Young, Robert V. Kenyon, and Charles M. Oman Jun. 1981 20 p refs
(Grant NsG-2032)
(NASA-CR-164437) Avail: NTIS HC A02/MF A01 CSCL 06P

The etiology of space motion sickness and the underlying physiological mechanisms associated with spatial orientation in a space environment were investigated. Human psychophysical experiments were used as the basis for the research concerning the interaction of visual and vestibular cues in the development of motion sickness. Particular emphasis is placed on the conflict theory in terms of explaining these interactions. Research on the plasticity of the vestibulo-ocular reflex is discussed. T.M.

N81-25666*# Wayne State Univ., Detroit, Mich.
DETERMINATION OF IN VIVO MECHANICAL PROPERTIES OF LONG BONES FROM THEIR IMPEDANCE RESPONSE CURVES Final Report
Stephen G. Borders [1981] 262 p refs
(Grant NsG-2008)
(NASA-CR-164441) Avail: NTIS HC A12/MF A01 CSCL 06P

A mathematical model consisting of a uniform, linear, visco-elastic, Euler-Bernoulli beam to represent the ulna or tibia of the vibrating forearm or leg system is developed. The skin and tissue compressed between the probe and bone is represented by a spring in series with the beam. The remaining skin and tissue surrounding the bone is represented by a visco-elastic foundation with mass. An extensive parametric study is carried out to determine the effect of each parameter of the mathematical model on its impedance response. A system identification algorithm is developed and programmed on a digital computer to determine the parametric values of the model which best simulate the data obtained from an impedance test. E.D.K.

N81-25667*# Wisconsin Univ., Madison. Biomedical Applications Team.
NASA: BIOMEDICAL APPLICATIONS TEAM Final Report, Jan. 1978 - Jan. 1981
Jan. 1981 22 p refs
(Contract NAS5-24385)
(NASA-CR-166672) Avail: NTIS HC A02/MF A01 CSCL 06B

The status of projects involving the adaptation of NASA technologies for medical purposes is reviewed. Devices for the measurement of joint deformation of arthritic hands, the development of an artificial pancreas, provision of an auditory signal to avert epileptic seizures, are described along with the control of medication levels, a compressed air tank to supply power for field dentistry, and an electroencephalogram monitor. The use of the Lixiscope as a portable fluoroscope, thermal laminates for hand and foot warmers for patients with Raynaud's syndrome, and the use of absorptive coatings for instruments for controlling medication levels are described. The applicability of occupation health and safety practices to industry, computerized patient scheduling, impregnation of the common facial tissue with an agent for killing respiratory viruses, commercial applications of anthropometric data, and multispectral image analysis of the skin as a diagnostic tool are reviewed. J.D.H.

N81-25668*# Raines (Jeremy K.), Bethesda, Md.
ELECTROMAGNETIC FIELD INTERACTIONS WITH THE HUMAN BODY: OBSERVED EFFECTS AND THEORIES
Jeremy K. Raines 9 Apr. 1981 123 p refs
(NASA Order S-75151-B)
(NASA-CR-166661) Avail: NTIS HC A06/MF A01 CSCL 06R

The effects of nonionizing electromagnetic (EM) field interactions with the human body were reported and human related studies were collected. Nonionizing EM fields are linked to cancer in humans in three different ways: cause, means of detection, and effective treatment. Bad and benign effects are expected from nonionizing EM fields and much more knowledge is necessary to properly categorize and qualify EM field characteristics. It is concluded that knowledge of the boundary between categories, largely dependent on field intensity, is vital to proper future use of EM radiation for any purpose and the protection of the individual from hazard. E.A.K.

N81-25669# Wittenberg Univ., Springfield, Ohio.
HUMAN SENSITIVITY TO HIGH FREQUENCY SINE WAVE AND PULSED LIGHT STIMULATION AS MEASURED BY THE STEADY STATE CORTICAL EVOKED RESPONSE
Glenn F. Wilson and Robert D. ODonnell (Aerospace Medical Research Lab.) Wright-Patterson AFB, Ohio AFAMRL Feb. 1981 21 p refs
(Grant AF-AFOSR-0156-79; AF Proj. 7184)
(AD-A097730; AFAMRL-TR-80-133) Avail: NTIS HC A02/MF A01 CSCL 06/16

The steady state cortical evoked response shows enhanced amplitude to a visual stimulus which is flickered in the frequency range between 38 Hz and 66 Hz. In this study, amplitude was found to be greatest at one particular frequency of stimulation, with the magnitude of the response to the peak frequency as much as double the amplitude of the surrounding frequencies.

While all subjects demonstrated this enhancement, the particular frequency at which it was found varied from subject to subject. The range of peak frequencies was found to be 50 Hz to 56 Hz for the subjects studied. Sine wave modulated light produced this effect, while stroboscopic stimuli in the same frequency range did not produce it as clearly. It is hypothesized that this narrowly tuned response may be related to a subject's performance, as well as to other physiological characteristics of the individual. Since this amplitude increase is narrowly tuned, it is suggested that the advantages and disadvantages of stimulating humans at their peak frequency should be determined. Possible uses of this phenomena for studying brain functioning and behavior are discussed. Author (GRA)

N81-25670# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Vision.
EFFECTS OF MICROWAVE RADIATION ON THE LENS OF THE EYE
Jan. 1981 20 p refs
(Contract N00014-80-C-0159)
(AD-A097757) Avail: NTIS HC A02/MF A01 CSCL 06/18

The effects of microwave radiation on the lens of the eye, particularly in regard to potential for cataractogenesis at low exposure levels are examined. The partially understood biophysical mechanism of microwave cataractogenesis is discussed. No evidence was found for cataract induction by microwave fields of less than 10 per sq cm. E.A.K.

N81-25671# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario). Biosciences Div.
A USER GUIDE TO THE DCIEM XDC-1 DIGITAL COMPRESSION CALCULATOR
R. Y. Nishi Oct. 1980 59 p
(AD-A096746; DCIEM-TC-80-C-58) Avail: NTIS HC A04/MF A01 CSCL 09/2

The calculator is a microprocessor-controlled computer based on the DCIEM pneumatic analogue decompression computer for calculating the safe ascent depth of divers. The calculator is a versatile instrument which can be used for planning and analyzing dives in the calculator mode, or for on line dive monitoring in the real time mode. The parameters used in the calculation of the decompression model are accessible from the keyboard and can be changed for investigating theoretical modifications to the model. The XDG-1 and the various ways in which it can be used for calculating decompression profiles and monitoring dives are described. Examples of calculations are presented. T.M.

N81-25672# School of Aerospace Medicine, Brooks AFB, Tex.
E-4B CREW FATIGUE ASSOCIATED WITH 30-HOUR IOT/E MISSION Final Report, 1 Feb. 1978 - 31 Mar. 1980
William F. Storm Oct. 1980 23 p refs
(AF Proj. 7930)
(AD-A094839; SAM-TR-80-40) Avail: NTIS HC A02/MF A01 CSCL 06/10

The Air Force Test and Evaluation Center (AFTEC) conducted an independent 45-day IOT/E of the Advanced Airborne Command Post (E-4B aircraft) system from 27 December 1978 to 11 February 1979. A 30-hour continuously airborne mission was flown 6-7 February 1979 to demonstrate the extended mission capability of the E-4B system. Using a battery of psychobiological measures, the Crew Technology Division of the USAF School of Aerospace Medicine (USAFSAM/VN) evaluated crew fatigue associated with the extended mission. The battery consisted of sleep surveys, subjective fatigue ratings, and mood surveys, as well as endocrine/metabolic indices derived from urine samples. Data were systematically collected from 66 crewmen at 4-hour intervals during the mission and for 3 1/2 days after the mission. The data were reduced for six functional crew groups: flightcrew, stewards, radio operators, radio maintenance technicians, aircraft maintenance technicians, and the National Emergency Airborne Command Post (NEACP) battle staff. Fatigue and stress levels that occurred during the 30-hour mission were moderate and not suggestive of compromises in performance and safety. Fragmented sleep acquired in the bunks and passenger seats was of restorative value and contributed to the abeyance of severe fatigue and negative mood states during the mission. Severe levels of subjective fatigue were reported a few hours after mission completion, but after 2 nights of uninterrupted sleep in the home environment, the crews were sufficiently recovered to resume normal ground and flight duties. GRA

N81-25673# School of Aerospace Medicine, Brooks AFB, Tex.
FORTY-EIGHT VERSUS TWENTY-FOUR HOUR DUTY FOR USAF MISSILE CREWS: A FEASIBILITY STUDY USING SUBJECTIVE MEASURES OF FATIGUE Final Report, Aug. 1978 - Mar. 1980
Stephen F. Gray Nov. 1980 57 p refs
(AF Proj. 7930)
(AD-A094837; SAM-TR-80-39) Avail: NTIS HC A04/MF A01 CSCL 06/16

The purpose of this study was to assess the feasibility of implementing a 48-hour work schedule for missile launch crews of a United States Air Force operational missile wing. A 90-day field test using two operational Minuteman missile squadrons as test and control groups was accomplished during the winter of 1978-1979 at Grand Forks Air Force Base, North Dakota. Subjective reports of fatigue and the quantity and quality of sleep were recorded daily by crew members during work and while they were off duty. In addition, subjective reports of workload and disruptions of sleep were gathered during alerts. Subsets of data from at most 10 distributed alerts for each crew member were subjected to analyses of variance. The primary analyses were tests for differences between the responses of crew members working a new 48 hour vs. those working the standard 24 hour schedule. Scaled subjective reports of fatigue at the end of alert, after driving back to base, and after 24 hours of recovery indicated no significant differences between the two work schedules. Tests for interactions of the work schedules with activities during alerts, specific control centers, and cumulative or maturational effects over several alerts showed no effects that might have masked real differences between the work schedules. In conclusion, a recommendation was made that the 48-hour work schedule was feasible under the specific circumstances used in this study. GRA

N81-25674# School of Aerospace Medicine, Brooks AFB, Tex.
MISSION CREW FATIGUE DURING RIVET JOINT BLOCK 2 DEMONSTRATION/EVALUATION Final Report, Jan. 1977 - Feb. 1980
William F. Storm Nov. 1980 20 p refs
(AF Proj. 7930)
(AD-A094822; SAM-TR-80-37) Avail: NTIS HC A02/MF A01 CSCL 06/19

RIVET JOINT is a USAF Electronic Systems Command (ESC) airborne (RC-135) reconnaissance system. The objectives of an ongoing modernization program are to improve mission capability and manpower utilization through use of state-of-the-art computer technology and surveillance equipment. A prototype modernized system recently underwent testing and evaluation in the real-world operational environment. ESC/SD requested that the USAF School of Aerospace Medicine (USAFSAM/VN) evaluate the impact of the system on operator stress and fatique. Psychobiological data were systematically collected from 13 operators over 6 consecutive days, including two 8-hour airborne test missions. The subjective fatigue and physiological cost associated with the test missions were moderate and did not suggest compromises in performance and safety. The operators were fully recovered from each of the test missions after an extended postmission night of sleep. GRA

N81-25675# Saint Louis Univ., Mo. School of Medicine.
THE INVESTIGATION OF METABOLIC AND CARDIOVASCULAR RESPONSES TO FATIGUING STATIC EFFORT Final Report
A. R. Lind, J. S. Petrofsky, C. A. Williams, T. E. Dahms, and G. Kamen 27 Aug. 1980 22 p refs
(Grant AF-AFOSR-3084-76; AF Proj. 2312)
(AD-A094804; AFOSR-81-0085TR) Avail: NTIS HC A02/MF A01 CSCL 06/19

In the animal experiments a new method of stimulating muscles was developed in the laboratory to mimic voluntary contractions. Cat muscles were stimulated to fatigue at various constant tensions. The soleus muscle (slow twitch) did not fatigue unless the tension exceeded 30% of maximal strength whereas the plantaris muscle (fast-twitch) fatigued at all tensions above 3% of maximal strength. Fatigue was not attributable to failure of the neuromuscular junction. Fatiguing contractions of the soleus

muscle did not elicit an increase in blood pressure whereas fast-twitch muscles did so, just as in voluntary contractions in man. In human studies, women held given fractions of maximal strength longer than men. But because men are stronger than women, transposing the same data into absolute tension shows that the men have a longer isometric endurance for any given tension examined. Electromyographic studies show that the integrated amplitude increases as contractions are held to fatigue by about the same amount, irrespective of the tension held. The frequency of the electromyogram fell by an absolute amount all tensions. This kind of analysis may be used as a tool to detect fatigue. Extensive studies of the control of muscle blood flow showed that during intermittent isometric exercise, local metabolites were responsible for dilating the vessels but that the effect could be opposed, in part, by neural vasoconstriction. GRA

N81-25676# Kentucky Univ., Lexington.
RESPONSE OF THE CARDIOVASCULAR SYSTEM TO VIBRATION AND COMBINED STRESSES Interim Progress Report, 1 Oct. 1979 - 30 Sep. 1980
Charles F. Knapp, J. M. Evans, and D. R. Randall Nov. 1980 59 p refs
(Grant AF-AFOSR-0039-80; AF Proj. 2312)
(AD-A094792; AFOSR-81-0083TR) Avail: NTIS HC A04/MF A01 CSCL 06/19

Studies of the previous year indicated an inability of cardiac denervated dogs to maintain stroke volume during the positive g sub z portion of sinusoidal plus or minus 2 g sub z acceleration stress across the frequency range of 0.004 to 0.25 Hz. To investigate the inadequacy of stroke volume maintenance in these chronically instrumented animals, three cardiac dimensions have been added to provide heart volume information in addition to our standard instrumentation for measuring aortic flow and left and right ventricular and aortic arch pressures. To date, crystals have been implanted to record heart size in 27 animals (16 normal and 11 cardiac denervated) whose body weights ranged from 17 to 26 Kg. GRA

N81-25677# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Aerospace Medical Div.
RADIOACTIVE MICROSPHERE STUDY OF CEREBRAL BLOOD FLOW UNDER ACCELERATION
Kevin J. Greenless, James E. Yoder, David M. Toth, Clarence M. Oloff, and Alva Karl (Systems Research Labs., Inc.) Nov. 1980 13 p refs
(AF Proj. 7222)
(AD-A094623; AFAMRL-TR-80-50) Avail: NTIS HC A02/MF A01 CSCL 06/19

A study using radioactive microspheres for the investigation of cerebral blood flow during acceleration is described. Details of a technique for the blunt dissection of cerebral tissues are included. Results of flow studies at 3 and 5 G sub z acceleration stress indicate there is no selective regional preservation of cerebral tissue. GRA

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N81-25678# Princeton Univ., N. J. Dept. of Statistics.
EYE-FITTING OF STRAIGHT LINES
Frederick Mosteller, Andrew F. Siegel, Edward Trapido, and Cleo Youtz Jan. 1981 12 p refs
(Grants DAAG29-79-G-09295; NSF SOC-75-15702; PHS-5-D04-AH01698-02)
(AD-A096716; TR-183-SER-2; ARO-16669.5-M) Avail: NTIS HC A02/MF A01 CSCL 12/1

An empirical investigation was carried out in which inexperienced students were instructed to locate a line for estimating y from x for four sets of points. They tended to choose slopes near that of the first principal component (major axis) of the data and their lines passed close to the centroids. Students had a slight tendency to choose consistently either steeper or shallower slopes for all sets of data. T.M.

N81-25679# Northwestern Univ., Evanston, Ill. Neuroscience Lab.
ENHANCING SENSITIVITY TO VISUAL MOTION Final Report
Robert Sekuler May 1980 38 p refs
(Grant AF-AFOSR-0064-79; AF Proj. 2313)
(AD-A094793; AFOSR-81-0090TR) Avail: NTIS HC A03/MF A01 CSCL 06/16

This report reviews a one-year investigation of techniques that might enhance an observer:s sensitivity to moving targets. The five experiments reported here cover a broad range of such techniques. Experiment 1 measured direction difference thresholds as a function of target velocity for 39 observers. Despite large (nearly fourfold) individual differences in thresholds, it was clear that ability to tell what direction a target moved in depended strongly on its velocity. In addition, this ability was seriously degraded for an oblique direction compared to performance with upward motion. Experiment 2 showed that this variation in threshold with target velocity was independent of the distance traveled by that target. This finding contradicts one common theory of motion preception. Experiment 3 measured difference thresholds for direction at various points in the course of training with a reaction time task. This task required observers to respond rapidly to moving targets presented after exposure to the broadband or filtered directional noise. The reaction times to motion onset decreased with practice but the direction difference thresholds did not show any comparable change. Experiment 4 examined the effect of practice on the performance deficit produced by an observer:s uncertainty about the direction in which a to-be-detected target would travel. GRA

N81-25680# Naval Postgraduate School, Monterey, Calif.
A MODEL TO MEASURE BOMBARDIER/NAVIGATOR PERFORMANCE DURING RADAR NAVIGATION IN DEVICE 2F/14, A-6E WEAPON SYSTEM TRAINER M.S. Thesis
Ted R. Mixon Mar. 1981 302 p refs
(AD-A098776) Avail: NTIS HC A14/MF A01 CSCL 05/9

This thesis modeled a performance measurement system for the Bombardier/Navigator (B/N) Fleet Replacement Squadron student during low level radar navigation flight in the Navy A-6E Weapon System Trainer. The model was designed to determine student skill acquisition measures for the purpose of providing information for decision-making by the squadron instructor and training manager. Model formulation methodology was based on a literature review of aircrew performance measurement from 1962-1980 and an analytical task analysis of the B/N's duties. Over 50 currently accessible candidate measures were listed and a proposal was made for a competitive exercise using A-6E fleet aircrews flying preprogrammed routes to establish performance standards using the candidate measures. Multivariate discriminate analysis was recommended for measure reduction. A sequential sampling decision model selected for evaluation provided fixed decisional error rates for successful training termination decisions and used both objective and subjective performance measures. Several display formats were recommended for use in debriefing. GRA

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N81-25681*# Baylor Univ., Houston, Tex. Dept. of Dermatology.
EVALUATION OF MATERIALS PROPOSED FOR USE IN SPACE FLIGHT Final Report
W. Christopher Duncan Mar. 1981 4 p
(Contract NAS9-14407)
(NASA-CR-160991) Avail: NTIS HC A02/MF A01 CSCL 11E

The primary irritancy and allergenicity of flame resistant

treated cotton knit shirts proposed for use in space flight were evaluated. The knitted shirts were supplied by NASA as follows: knitted shirts with collars were made of two-ply mercerized single-knit cotton jersey. The fabric was treated with tetrakis (hydroxymethyl) phosphonium hydroxide and subsequently cured with gaseous ammonia (THPOH/NH3). The final treatment comprised adding on diammonium phosphate (DAP)/urea. The treated fabric was process scoured to remove extraneous materials, top softened and mechanically or chemically finished as required for specific needs. Diammonium phosphate is a more efficient flame inhibitant than the phosphonium; thus, the combination treatment served to impart higher resistance to ignition and sustained combustion as required by NASA test standard. S.F.

N81-25682# Dynamics Research Corp., Wilmington, Mass.
HUMAN RESOURCES, LOGISTICS AND COST FACTORS IN WEAPON SYSTEM DEVELOPMENT DEMONSTRATION IN THE FULL SCALE DEVELOPMENT PHASE OF AIRCRAFT SYSTEM ACQUISITION Final Report
Gerard F. King and William B. Askren (Air Force Human Resources Lab.) Feb. 1981 90 p refs
(Contract F33615-77-C-0016; AF Proj. 1959)
(AD-A096731; AFHRL-TR-80-52) Avail: NTIS HC A05/MF A01 CSCL 05/9

A three part demonstration of the five coordinated human resources technology (CHRT) on an aircraft acquisition program is reported. The five human resource technology categories are: maintenance manpower modeling, human resource in design tradeoffs, instructional system development, job guide development, and system owvership costing. A consolidated data base (CDB), which services the five integrated technologies is also included. The feasibility of applying the CHRT and CDB to the full scale development phase of acquisition in avionics and landing gear systems is demonstrated. E.A.K.

N81-25683# School of Aerospace Medicine, Brooks AFB, Tex. Crew Performance Branch.
FATIGUE AND WORKLOAD IN FOUR-MAN C-5A COCKPIT CREWS (VOLANT GALAXY) Final Report, 1 Oct. 1979 - 1 Feb. 1980
William F. Storm and John T. Merrifield Aug. 1980 46 p refs
(AF Proj. 7930)
(AD-A094498; SAM-TR-80-23) Avail: NTIS HC A03/MF A01 CSCL 05/9

Triple Inertial Navigation Systems (INS) are being installed on C-5A aircraft. At the request of the USAF Airlift Center, aircrew fatigue and workload were evaluated in 4-man C-5A cockpit crews (aircraft commander, copilot, and 2 flight engineers) performing typical long-range transport missions on triple-INS-equipped aircraft. Most of the navigator's duties were assumed by the pilots with the balance assigned to the flight engineer station. Considering subjective fatigue and workload findings, discussions with crewmen, the workloads reported during emergencies and aerial refuelings, and the operational requirements of wartime conditions, it was recommended that the 4-man C-5A crew concept not be implemented at this time. GRA

N81-25684# Rowland and Co., Haddonfield, N. J.
TRAINING IMPLICATIONS OF AIRBORNE APPLICATIONS OF AUTOMATED SPEECH RECOGNITION TECHNOLOGY Final Technical Report, Jul. - Oct. 1980
Paul E. VanHemel, Susan B. VanHemel, W. Judson King, and Robert Breaux (Naval Training Equipment Center) Oct. 1980 64 p refs Prepared in cooperation with Ergonomics Associates, Inc., Orlando, Fla.
(Contract N61339-80-D-0009)
(AD-A098625; NAVTRAEQUIPC-80-D-0009-0155) Avail: NTIS HC A04/MF A01 CSCL 05/9

Developments in automated voice recognition and synthesis have made feasible the implementation of automated speech recognition (ASR) technology in airborne systems. Research systems using voice technology at the Naval Training Equipment Center and at the Naval Air Development Center were analyzed to determine the human factors of using automated speech recognition for communication with machines. The human factors identified present some unique training implications. The following specific recommendations were made with respect to Instructional Systems Development and particularly to the development of training media. Instructional systems using ASR should: (1) Be developed by instructional designers who have had hands-on experience with ASR technology; (2) Provide ASR speech behavior models, especially correct ones, for trainees to emulate, with the models chosen to illustrate specific factors in achieving successful recognition; (3) Provide convenient and effective means by which trainees can evaluate their own speech behavior; and (4) Provide convenient voice recognition test and voice reference pattern update capabilities under trainee control. Recommendations are also provided for training for the use of airborne ASR systems. GRA

N81-25685# Science Applications, Inc., Los Angeles, Calif.
MEASUREMENT OF HEAD ACCELERATIONS OF BOXERS, FEASIBILITY STUDY Final Report, Mar. 1978 - Oct. 1980
D. F. Hausknecht, M. Axelrod, and R. Hoard May 1980 85 p
(Contract DOT-HS-8-01893)
(PB81-152191; DOT-HS-805664; SAI-068-81-513) Avail: NTIS HC A05/MF A01 CSCL 13L

A miniaturized accelerometer transmitter in the boxer's mouthpiece permits blow by blow telemetering of head motion data to ringside for later analyses and correlation with observed responses. The feasibility of performing these measurements was examined by conducting a survey of boxing activities (professional and amateur), performing an assessment of the safety and legal requirements, and improving packaging design to enhance boxer comfort and acceptance of a mouthpiece containing the instrumentation. Acceptibility tests with a boxer wearing a mouthpiece with a mockup of the instrument and sparring, were conducted. A three-phased plan for conducting the measurements is described and favorable test sites are given. GRA

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering*.

N81-25686 Texas Univ. at Arlington.
THE PLANNED EVOLUTION OF DISTRIBUTED COMPUTING SYSTEMS Ph.D. Thesis
Carole Elaine Essig Kincaid 1980 202 p
Avail: Univ. Microfilms Order No. 8109194

The problem of planning for the development of distributed computing systems is explored. It is noted that the capacity for future system modifications to meet changing user needs over several periods should be included in the original system. Factors that create the need for system change are presented and example systems requiring such change are described. Suggestions are made for combining forecasts for workload increases, available

finances, and equipment characteristics with static distributed system design procedures to produce multiperiod design algorithms. Such algorithms yield a system design for each of several periods and attempt to reduce the disruptions, costs, and delays, resulting from making modifications to the system over several periods. The configuration in one period is based on forecasts and on the preceding period's configuration. Several heuristic algorithms for the multiperiod design of relatively small, homogeneous, hierarchical systems are developed, tested, and compared. Different algorithms are shown to be suitable for different situations. Dissert. Abstr.

N81-25687 Illinois Univ. at Urbana-Champaign.
HARDWARE FOR SEARCHING VERY LARGE TEXT DATABASES Ph.D. Thesis
Roger Lee Haskin 1980 155 p
Avail: Univ. Microfilms Order No. 8108534

The problems involved in searching very large text databases are discussed. It is shown that conventional techniques for searching current databases cannot be scaled up to larger ones, and that it is necessary to build hardware to search the database in parallel if reasonable search times are expected. The part of the search process requiring the highest bandwidth is scanning the database to detect instances of search terms. Methods from the literature of doing this in hardware are examined, problems with using them in large systems are discussed, and design criteria to be met by a successful search architecture are defined. A model for text searching, using a nondeterministic finite state automation (NFSA) to control matching, is introduced. Examples are given showing how it can be used to search for a wide variety of textual patterns. Implementation of the NFSA Searcher in hardware is discussed. Dissert. Abstr.

N81-25688 Illinois Univ. at Urbana-Champaign.
PERFORMANCE MODELING OF MULTIPROCESSOR SYSTEMS WITH PAGING Ph.D. Thesis
Alan Dale Gant 1980 97 p
Avail: Univ. Microfilms Order No. 8108511

An analytic model to describe the performance of a wide range of multiprocessor system configurations and workloads is discussed. This model deals specifically with P tightly-coupled, identical processors with shared primary and secondary memory. Secondary memory consists of a paging drum with S sectors. The workload consists of J independent, identically-distributed jobs whose faulting or I/O behavior is described by both a mean and a squared coefficient of variation. In addition, the processing overheat of each I/O request is added to a job's execution time at a processor. The model developed provides an estimate of system throughput for various numbers of processors, jobs, and drum sectors, and for various workloads. This model is based on a deterministic scheduling model for the system, and known models which describe the sub-parts of the system are embedded. The accuracy of the model is assessed by comparison to a large number of runs of a simulator using exponential and hyperexponential fault time distributions.
Dissert. Abstr.

N81-25689 Stanford Univ., Calif.
THE ROLE OF BUFFERING IN FILE SYSTEM PERFORMANCE Ph.D. Thesis
Michael Leonard Powell 1981 138 p
Avail: Univ. Microfilms Order No. 8108979

An automatic, adaptive buffering mechanism for input/output (IO) operations is described. Simulation was used to validate some of the basic assumptions about buffering behavior. A simple model of I/O involving a user program and rotating secondary storage device with a buffering agent between them was developed. Using Markov chain analysis the performance of a system with buffering is evaluated. The impact of variable length operations and seeks are investigated. Measurements done on a general purpose computing system are used to validate the assumed parameter values and to demonstrate the practicality of the approach. The analysis and buffering technique is applicable to intelligent disk controllers, multiple microprocessor systems, and networks of computers. Dissert. Abstr.

N81-25690*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A DESIGN APPROACH TO REAL-TIME FORMATTING OF HIGH SPEED MULTISPECTRAL IMAGE DATA
Barry D. Meredith and W. Lane Kelly, IV May 1981 20 p refs
(NASA-TP-1870; L-14454) Avail: NTIS HC A02/MF A01 CSCL 09B

A design approach to formatting multispectral image data in real time at very high data rates is presented for future onboard processing applications. The approach employs a microprocessor-based alternating buffer memory configuration whose formatting function is completely programmable. Data are read from an output buffer in the desired format by applying the proper sequence of addresses to the buffer via a lookup table memory. Sensor data can be processed using this approach at rates limited by the buffer memory access time and the buffer switching process delay time. This design offers flexible high speed data processing and benefits from continuing increases in the performance of digital memories. Author

N81-25691# Army Aviation Research and Development Command, St. Louis, Mo.
AN AIRBORNE PROGRAMMABLE DIGITAL TO VIDEO CONVERTER INTERFACE AND OPERATION MANUAL
Vincent J. Organic and Edward A. Karcher Feb. 1981 62 p refs
(AD-A096422; AVRADCOM-TR-80-E-4) Avail: NTIS HC A04/MF A01 CSCL 09/2

The operational commands, data structure and storage, and interface to the airborne programmable digital to video converter (DVC) are described. The DVC accepts and converts data from an external digital computer into a standard 525 line television format which can be displayed either in black and white or color. The system was developed for night navigation/pilotage and nap of the Earth helicopter flight studies. M.G.

N81-25692# Stuttgart Univ. (West Germany). Inst. fuer Informatik.
COMMUNICATION INTERFACE FOR A SYSTEM OF DISTRIBUTED PROCESSES Final Report, 31 Mar. 1980 - 31 Mar. 1981
E. J. Neuhold and K. Boehme 3 Mar. 1981 67 p refs
(Grant DA-ERO-79-G-008; DA Proj. 1T1-61102-BH-57)
(AD-A098754) Avail: NTIS HC A04/MF A01 CSCL 09/2

Interprocess communication (IPC) has been investigated. The result is a system consisting of 7 layers (as proposed by ISO/TC97/SC16), which has been implemented. The layers 1 - 3 build the interface to a X.25 packet switching network. Their function has been specified by CCITT. As some parts are incompletely and incorrectly described, solutions have to be found to obtain a complete interface. New algorithms have been developed in the Transport Layer: end-to-end error control, in the Session Layer: connection establishment and release and in the presentation Layer: intelligent data converter. Author (GRA)

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N81-25693 Texas Univ. at Arlington.
THE DESIGN AND VERIFICATION OF A PROGRAMMING LANGUAGE FOR DISTRIBUTED PROCESSES COMMUNICATION Ph.D. Thesis
Tsang William Mao 1980 210 p
Avail: Univ. Microfilms Order No. 8109200

The design and validation of a programming language (DLCP) for a distributed environment where many processors cooperate to complete a single task are studied. The processors share no common memory and communicate with each other through hardware busses. The basic components in the language are processes, which are assumed to be executed in parallel. Since no shared variables exist, communication is by message passing. To simplify the implementation of the language, it is further assumed that the distributed environment does not support automatic buffering of messages. Information exchange therefore

must be totally synchronized. Communication Ports, influenced by Hoare's communicating sequential processes, are proposed as a generalized mechanism for both information exchange and synchronization among processes. In order to formally define the semantics of DLCP, Hoare's deductive system of axioms and assertions is extended to include distributed programs. Finally, the feasibility of implementing DLCP on a processor network is assessed. Dissert. Abstr.

N81-25694 Illinois Univ. at Urbana-Champaign.
AN ARRAY SIMULATOR GENERATOR Ph.D. Thesis
Daniel John Kopetzky 1980 67 p
Avail: Univ. Microfilms Order No. 8108567

A programming system which facilitates the production of bit-serial array computer simulators is described. The resultant programs emulate the action of a target machine to the resolution of single instructions. The timing of interactions between independent modules is faithfully reproduced. The system is useful for the development of low level routines for a new machine architecture or for the evaluation of variations in the structure of a given machine. A parallel processing architecture is dissected into modules for the purposes of simulation. The operations performed in a module are translated into separate programs written in C language. The simulation system coordinates the execution of individual programs to provide an emulation of the actions of the entire target machine. The resutling programs are run on a PDP 11 minicomputer running the UNIX operating system. The usefulness of the system is demonstrated by a comparative evaluation of three different array processing machines. Dissert. Abstr.

N81-25695 Illinois Univ. at Urbana-Champaign.
THE SYSTEMATIC DESIGN OF A PROTECTION MECHANISM TO SUPPORT A HIGH LEVEL LANGUAGE Ph.D. Thesis
Douglas Warren Jones 1980 135 p
Avail: Univ. Microfilms Order No. 8108556

The design process is formalized as a structured walk through the multidimensional computer design space toward an optimal machine. The starting point for this walk is the result of a semantic analysis of the problem to be solved, and the walk ends when no changes to the design result in any improvement. This design approach is used to arrive at a practical general purpose protection architecture from the programming language Ada. The semantic analysis of Ada required for this effort suggests a number of waysin which Ada or similar languages could be improved. In the process of examining problems with Ada, a protection structure design principle is identified: that the static and dynamic rights transfer mechanisms should parallel each other. A number of existing protection measures are surveyed, and these are extended to take into account the effects of combining different protection mechanisms. Dissert. Abstr.

N81-25696 *Stanford Univ., Calif.*
EFFICIENT ALGORITHMS FOR CERTAIN SATISFIABILITY AND LINEAR PROGRAMMING PROBLEMS *Ph.D. Thesis*
Bengt Ingemar Aspvall 1981 63 p
Avail: Univ. Microfilms Order No. 8108890

Efficient algorithms are presented for certain cases of Linear Equations solving (LE), Linear Programming (LP), and SATisfiability testing (SAT). The LP problem is Turing equivalent to solving Linear Inequalities (LI), where one asks whether a given set of linear inequalities has a solution or not. LE, LP and SAT were studied in both the theoretical and the applied areas of Computer Science. Efficient algorithms are presented for LE, LI and SAT for the cases in which there are at most two variables or literals per unit (equation, inequality, or clause). The algorithms for LE(2) and 2-SAT are linear time algorithms and they are optimal except for constant factors. The algorithm for LI(2) has a nonlinear worst case time bound, but the bound is better than the bound of any general LI algorithm such as the polynomial time algorithm. The subcases discussed are in some sense the hardest ones that are not as hard as the general problems, i.e., for LE, LI, and SAT, there is a difference in complexity when going from two to three variables or literals per unit. Dissert. Abstr.

N81-25697# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
GENERAL OPERATORS IN GLOBALLY CONSTRAINED STOCHASTIC DYNAMIC PROGRAMMING PROBLEMS
Moshe Sniedovich Aug. 1980 22 p refs
(CSIR-TWISK-170) Avail: NTIS HC A02/MF A01

A general Lagrangian procedure is developed for incorporating general operators in globally constrained stochastic dynamic programming problems. The method makes it possible to include the expected value, variance, and probability operators in dynamic programming problems subjected to a global constraint. While the inclusion of certain combinations of these operators may subject the procedure to the problem of dimensionality, it is indicated that there is a large class of problems for which the proposed method is computationally feasible. M.G.

N81-25698*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
KONFIG AND REKONFIG: TWO INTERACTIVE PREPROCESSING TO THE NAVY/NASA ENGINE PROGRAM (NNEP)
Lawrence H. Fishbach May 1981 59 p
(NASA-TM-82636; E-889) Avail: NTIS HC A04/MF A01 CSCL 09B

The NNEP is a computer program that is currently being used to simulate the thermodynamic cycle performance of almost all types of turbine engines by many government, industry, and university personnel. The NNEP uses arrays of input data to set up the engine simulation and component matching method as well as to describe the characteristics of the components. A preprocessing program (KONFIG) is described in which the user at a terminal on a time shared computer can interactively prepare the arrays of data required. It is intended to make it easier for the occasional or new user to operate NNEP. Another preprocessing program (REKONFIG) in which the user can modify the component specifications of a previously configured NNEP dataset is also described. It is intended to aid in preparing data for parametric studies and/or studies of similar engines such a mixed flow turbofans, turboshafts, etc. E.D.K.

N81-25699*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A COMPUTER PROGRAM FOR ESTIMATING THE POWER-DENSITY SPECTRUM OF ADVANCED CONTINUOUS SIMULATION LANGUAGE GENERATED TIME HISTORIES
H. J. Dunn Jun. 1981 26 p refs
(NASA-TM-83120; L-14217) Avail: NTIS HC A03/MF A01 CSCL 09B

A computer program for performing frequency analysis of time history data is presented. The program uses circular convolution and the fast Fourier transform to calculate power density spectrum (PDS) of time history data. The program interfaces with the advanced continuous simulation language (ACSL) so that a frequency analysis may be performed on ACSL generated simulation variables. An example of the calculation of the PDS of a Van de Pol oscillator is presented. Author

N81-25700# *General Research Corp., Santa Barbara, Calif.*
COBOL AUTOMATED VERIFICATION SYSTEM: STUDY PHASE Final Technical Report, Mar. - Sep. 1980
Richard Melton, Gary Greenburg, and Michael Sharp Griffiss AFB, N.Y. RADC Mar. 1981 84 p refs
(Contract F30602-80-C-0101; AF Proj. 2531)
(AD-A098755; RADC-TR-81-11) Avail: NTIS HC A05/MF A01 CSCL 09/2

The COBOL language, and automated software testing tools, have been studied in order to design an Automated Verification System for COBOL. The proposed functions and design of the system are summarized in this report. Details of the system are presented in the CAVS Functional Description and CAVS System/Subsystem Specification. To provide a perspective for the capabilities of the proposed system, this report contains a critique of the COBOL language, a description of methods of software testing, and a characterization of errors in COBOL. Considerations for future capabilities of the system are also outlined. GRA

N81-25701# *Naval Underwater Systems Center, New London, Conn.*
MACSYMA: A PROGRAM FOR COMPUTER ALGEBRAIC

MANIPULATION (DEMONSTRATIONS AND ANALYSIS)
R. Dew Drinkard, Jr. 10 Mar. 1981 94 p refs
(AD-A098647; NUSC-TD-6401) Avail: NTIS HC A05/MF A01 CSCL 09/2

The MACSYMA algebraic manipulation system is a collection of programs embedded in a LISP interpreter. It is currently implemented on the Incompatible Timesharing System (ITS) that operates on a PDP-10 known as the MC (MACSYMA Consortium) machine. This program is currently available to all employees at the Naval Underwater Systems Center via the NAval Laboratory COmputer Network (NALCON) or the ARPANET. This technical document provides the (potential) user of MACSYMA with a collection of illustrative examples of MACSYMA commands and an analysis of their effectiveness from the point of view of a new user. This document is not intended to serve as an instruction manual on the use of MACSYMA, but as a supplement to such a manual for the purpose of highlighting some common problems associated with its use. Author (GRA)

N81-25702# Ballistic Research Labs., Aberdeen Proving Ground, Md.
A SURVEY OF LINEAR REGRESSION COMPUTER PACKAGES
Richard T. Maruyama Feb. 1981 24 p refs
(DA Proj. 1L1-61102-AH-43)
(AD-A098659; AD-E430595; ARBRL-TR-00289) Avail: NTIS HC A02/MF A01 CSCL 09/2

This report is a survey of a number of linear regression computer packages. Linear regression statistical methods are continually being utilized as a tool to analyze large sets of data. Because of this widespread utilization, a survey to research the range of linear regression packages now available is appropriate. A number of major statistical packages were selected for this survey and a comparison table of their statistical characteristics is included in this report. The outcome of this survey is that today's major packages offer many additional options; some of the options, sometimes other subroutines, add a level of flexibility to the general regression analysis. GRA

N81-25703# Naval Training Analysis and Evaluation Group, Orlando, Fla.
***IMPLEMENTING THE COMPUTER READABILITY EDITING* SYSTEM (CRES) Final Report**
J. Peter Kincaid, Larry K. Cottrell, James A. Aagard, and Peter Risley Mar. 1981 181 p refs
(AD-A098530; TAEG-98) Avail: NTIS HC A09/MF A01 CSCL 09/2

This report describes how to implement the computer readability editing system (CRES). The CRES is a writer's aid to improve the comprehensibility of technical manuals and training materials. It contains features to: (1) flag uncommon words and long sentences; (2) suggest replacements for awkward words and phrases; and (3) calculate the readability grade level. The CRES is now being implemented as part of computer based publishing systems. This report contains the computer program flow charts described in that program, a user's guide, and a programmer's guide to help potential users. GRA

N81-25704# University of Southern California, Los Angeles. Dept. of Computer Science.
MODULAR DESIGN OF OPERATING SYSTEMS USING ABSTRACT DATA TYPES Final Report
Per Brinch Hansen and Jonathan Fellows Jun. 1980 10 p refs
(Grant DAAG29-77-G-0192)
(AD-A098439; ARO-15037.2EL) Avail: NTIS HC A02/MF A01 CSCL 09/2

This report describes the Trio operating system which enables users to simultaneously develop and execute programs at three terminals. The system is written in Concurrent and Sequential PASCAL and has been used on a PDP 11/55 minicomputer since Spring 1979. The Trio System is not available for distribution. Author (GRA)

N81-25705# Connecticut Univ., Storrs. Dept. of Electrical Engineering and Computer Science.
WORD MEANING SELECTION IN MULTIPROCESS LANGUAGE UNDERSTANDING PROGRAMS
R. E. Cullingford and M. J. Pazzani Feb. 1981 51 p refs
Sponsored in cooperation with DOD and ONR
(Contract N00014-79-C-0976)
(AD-A098353; TR-CS-80-12A) Avail: NTIS HC A04/MF A01 CSCL 09/2

A cooperative word meaning selector is described which allows the computer to use various knowledge sources as it 'understands' text. The word meaning selector is part of a conceptual analyzer which forms the natural language interface for a pair of multiprocess language processing systems. The first, called DSAM, (distributable script applier mechanism), reads and summarizes newspaper articles making heavy reference to situational scripts. The second, ACE (academic counseling experiment), is a conversational program which automates certain parts of the academic counseling task. In each of these systems a variety of knowledge sources, each managed by a distinct 'expert' process, is brought to bear to enable the word-meaning selector to form the most plausible reading of a sentence containing ambiguous words. GRA

N81-25706# Decisions and Designs, Inc., McLean, Va.
ADVISORY DECISION AIDS: A PROTOTYPE
John F. Patterson, L. Scott Randall, and Richard R. Stewart
Feb. 1981 51 p refs
(Contract MDA903-80-C-0194; DARPA Order 3831)
(AD-A098640; PR-80-27-312) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report describes an effort to develop a prototype advisory decision aid (ADA). The three types of computerized decision aids used in problem-solving tasks can be described by three metaphors. One type of computer aid performs laborious tasks which the user would otherwise have to perform. Another type attempts to replace the user entirely and solves the problem alone. The third type of computer aid acts as an advisor. This decision aid has information about the problem and has procedures for making suggestions, but it does not solve the problem. That is left up to the user. As much as possible, it is desirable to place the functions of an advisor within computers. Such aids could be grafted onto data base management systems in an effort to help users cope with their information. In this capacity, the advisory aid is the natural extension of the HELP option being included in many operating systems. With time and continued improvements in our knowledge of artificial intelligence and computer-assisted decision making, advisory aids of a much more elaborate variety are likely to be available. Author (GRA)

N81-25707# California Univ., Livermore. Lawrence Livermore Lab.
PLTLIB: GRAPHICS LIBRARY FOR TEKTRONIX 4025 AND 4127 TERMINALS
Hal R. Brand and Richard K. Yamauchi 25 Jan. 1981 65 p
(Contract W-7405-eng-48)
(UCID-18981) Avail: NTIS HC A04/MF A01

A graphics library written to plot experimental data in real time and to plot data analysis results interactively is described. The library is designed for use on Digital Equipment Corporation's RT-11 and RSX-11M operating systems. The graphics devices are the Tektronix 4025 and 4027 terminals and the Tektronix 4662 plotter. DOE

N81-25708# Sandia Labs., Albuquerque, N. Mex. Computer Aids Systems Development Div.
USER/PROGRAMMER GUIDE FOR UCMD 49 THICK-FILM RESISTOR LAYOUT
Karl E. Wiegandt Mar. 1981 25 p refs
(Contract DE-AC04-76DP-00789)
(SAND-81-0400) Avail: NTIS HC A02/MF A01

An Applicon AGS/870-1 User Command for parametrically constructing thick film resistor layouts of simple rectangular geometry is described. DOE

N81-25709# Federal Compiler Testing Center, Washington, D.C.
***HARRIS CORPORATION, HARRIS COBOL74 VERSION 9.0.0* INDEXED I-O MODULE**
2 Feb. 1981 12 p refs
(PB81-155947; FCTC/TR-80/09) Avail: NTIS
HC A02/MF A01 CSCL 09B

The FCTC technical report for the Indexed I-O Module of

the Harris Corp., H800 Cobol Compiler Version 9.0.0 (Vulcan Version 08A) provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the Indexed I-O Module of the 1974 Cobol Standard (X3.23-1974/FIPS PUB 21-1). This report is made up of several sections showing the discrepancies found. A companion report (validation summary report CCVS74-VSR670) provides information regarding the validation of the Compiler at the low intermediate level of Federal Standard Cobol (FIPS PUB 21-1). GRA

N81-25710# *Federal Compiler Testing Center, Washington, D.C.*
HARRIS CORPORATION FORTRAN 77 VERSION 9.0.0 Validation Summary Report
2 Feb. 1981 8 p refs
(PB81-155939; FCVS78-VSR671) Avail: NTIS
HC A02/MF A01 CSCL 09B

The validation summary report (VSR) for the Harris Corporation H800 FORTRAN 77 Compiler Version 9.0.0 (Vulcan Version 08A) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978). The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies; a section relating the categories of discrepancies to the language; and a detailed listing of discrepancies together with the tests which were failed. GRA

N81-25711# *Federal Compiler Testing Center, Washington, D.C.*
HONEYWELL INFORMATION SYSTEMS LEVEL 68/DPS - MULTICS COBOL VERSION 4.4 Validation Summary Report
21 Jan. 1981 66 p refs
(PB81-155921; CCVS74-VSR651) Avail: NTIS
HC A04/MF A01 CSCL 09B

The validation summary report (VSR) for the Honeywell Information Systems Level 68/DPS COBOL Compiler Version 4.4 (MR8.0 MULTICS Version) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated at the HIGH level of FIPS PUB 21-1. The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the federal levels of the language; and a detailed listing of discrepancies together with the tests which were failed. GRA

N81-25712# Federal Compiler Testing Center, Washington, D.C.
BURROUGHS CORPORATION SMALL SYSTEMS COBOL 74, RELEASE 10.0 Validation Summary Report
2 Feb. 1981 65 p refs
(PB81-155608; CCVS74-VSR696) Avail: NTIS
HC A04/MF A01 CSCL 09B

The validation summary report (VSR) for the Burroughs B1855 COBOL Complier Version 10.0 (MCPII Version X.0) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIBS PUB 21-1). The compiler was validated at the HIGH level of FIPS PUB 21.1. The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the federal levels of the language; and a detailed listing of discrepancies together with the tests which were failed. GRA

N81-25713# Federal Compiler Testing Center, Washington, D.C.
HONEYWELL INFORMATION SYSTEMS LEVEL 66/DPS - GCOS COBOL CB4.0 Validation Summary Report
21 Jan. 1981 66 p refs
(PB81-155590; CCVS74-VSR650) Avail: NTIS
HC A04/MF A01 CSCL 09B

The validation summary report (VSR) for the Honeywell Information Systems Level 66/DPS COBOL Compiler Version CB4.0 (SR4JS2 Version DPS1.2-GCO) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated at the HIGH level of FIPS PUB 21-1. The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the federal levels of the language; and a detailed listing of discrepancies together with the tests which were failed. GRA

N81-25714# Federal Compiler Testing Center, Washington, D.C.
SPERRY UNIVAC OS/3 COBOL, VERSION 7.0 Validation Summary Report
28 Jan. 1981 70 p refs
(PB81-155582; CCVS74-VSR755) Avail: NTIS
HC A04/MF A01 CSCL 09B

The validation summary report (VSR) for the Sperry Univac 90/40 OS/3 COBOL Compiler Version 7.0 (OS/3 Version 7.0) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated at the HIGH level of FIPS PUB 21-1. The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the federal levels of the language; and a detailed listing of discrepancies together with the tests which were failed. GRA

N81-25715# Federal Compiler Testing Center, Washington, D.C.
HONEYWELL INFORMATION SYSTEMS COBOL CP-6 (A02)-DPS/C Validation Summary Report
2 Dec. 1981 70 p refs
(PB81-151722; CCVS74-VSR652) Avail: NTIS
HC A04/MF A01 CSCL 09B

The validation summary report (VSR) for the Honeywell DPS/C COBOL Compiler Version A02 (A01 Operating System) provides a consolidated symmary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated at the HIGH level of FIPS PUB 21-1. The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the federal levels of the language; and a detailed listing of discrepancies together with the tests which were failed. GRA

N81-25716# Federal Compiler Testing Center, Washington, D.C.
HARRIS CORPORATION HARRIS COBOL74 VERSION 9.0.0 Validation Summary Report
2 Feb. 1981 48 p
(PB81-151714; CCVS74-VSR670) Avail: NTIS
HC A03/MF A01 CSCL 09B

The validation summary report (VSR) for the Harris Corporation H800 Cobol Compiler Version 9.0.0 (Vulcan Version 08A) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 Cobol Standard (X3.23-1974/FIPS PUB 21-1). The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the federal levels of the language; and a detailed listing of discrepancies together with the tests which were failed. GRA

N81-25717# Federal Compiler Testing Center, Washington, D.C.
WANG LABORATORIES, INC., WANG VS COBOL 3.2.0 INDEXED I-O MODULE, LEVEL 1
21 Jan. 1981 10 p refs
(PB81-151581; FCTC/TR-80/11) Avail: NTIS
HC A02/MF A01 CSCL 09B

This FCTC technical report for the Indexed I-O Module of the Wang Laboratories, Inc., VS COBOL Compiler Version 3.2.0 (O.S. Version 4.2.12) provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the Indexed I-O Module of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). This report is made up of several sections showing the discrepancies found. A companion report

(validation summary report CCVS74-VSR705) provides information *regarding the validation of the Compiler at the LOW level* of Federal Standard COBOL (FIPS PUB 21-1). GRA

N81-25718# Federal Compiler Testing Center, Washington, D.C.
WANG LABORATORIES, INC., WANG VS COBOL 3.2.0. *Validation Summary Report*
21 Jan. 1981 40 p
(PB81-151573; CCVS74-VSR705) Avail: NTIS
HC A03/MF A01 CSCL 09B

The validation summary report (VSR) for the Wang Laboratories, Inc., VS COBOL Compiler Version 3.2.0 (O.S. Version 4.2.12) *provides a consolidated summary of the results obtained from* the validation of the subject compiler against the 1974 COBOL Standard, (X3.23-1974/FIPS PUB 21-1). The compiler was *validated at the LOW level of FIPS PUB 21-1. The VSR is* made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the federal levels of the language; and a detailed listing of discrepancies together with the tests which were failed. GRA

N81-25719# *Federal Compiler Testing Center, Washington, D.C.*
FEDERAL CSS, INC., IBM 360/370 OS/VS COBOL RELEASE 2.3 PTR 8 INDEXED I-O MODULE
21 Jan. 1981 10 p refs
(PB81-151391; FCTC/TR-80/08) Avail: NTIS
HC A02/MF A01 CSCL 09B

This FCTC technical report for the Indexed I-O Module of the IBM 360/370 OS/VS COBOL Compiler Version 2.3 PTF8 (VP/CSS Version .304) provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the Indexed I-O Module of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). This report is made up of several sections showing the discrepancies found. A companion report (validation summary report CCVS74-VSR645) provides information *regarding the validation of the Compiler at the HIGH* INTERMEDIATE level of Federal Standard COBOL (FIPS PUB 21-1). GRA

N81-26021# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
***PROGRAMMING BY POLYALGORITHMS. DESCRIPTION* AND EXAMPLES OF IMPLEMENTATION**
C. Jamy, M. Vanbreugel, and A. Potel *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-6 (ESA-TT-687) Dec. 1980 p 77-90 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-6, Nov. - Dec. 1980 p 445-458 Original report in FRENCH previously announced as A81-19555
(For primary document see N81-26015 16-99)
Avail: NTIS HC A05/MF A01

62 COMPUTER SYSTEMS

Includes computer networks.

N81-25720# *Georgia Inst. of Tech., Atlanta. School of* Information and Computer Science.
DISTRIBUTED AND DECENTRALIZED CONTROL IN FULLY *DISTRIBUTED PROCESSING SYSTEMS: A SURVEY OF* APPLICABLE MODELS Final Technical Report, 15 Jan. - 30 Sep. 1980
Philip H. Enslow and Timothy G. Saponas Feb. 1981 113 p refs
(Contract F30602-78-C-0120)
(AD-A096683; GIT-ICS-81/02; GIT-ICS-61/02) Avail: NTIS
HC A06/MF A01 CSCL 09/2

Distributed and decentralized control was initiated with a survey of applicable control models. An extensive discussion of the control problems applicable of distributed systems, specifically fully distributed systems, is included. S.F.

N81-25721# Hawaii Univ. at Manoa, Honolulu. Dept. of Electrical Engineering.
COMPUTER NETWORKS. THE ALOHA SYSTEM Technical Report, 1970 - 1976
Franklin F. Kuo May 1981 15 p refs
(Contract N00014-78-C-0498)
(AD-A098684; CCIS-7) Avail: NTIS HC A02/MF 01 CSCL 09/2

The ALOHA System, an experimental UHF radio computer communication network, was developed at the University of Hawaii during 1970-76. In this survey paper, we give a general overview of packet communication techniques applied to computer networks. *Then we discuss the concept of packet broadcasting* and give a short discription of the ALOHANET. Next, a discussion of the application of ALOHA techniques to satellite communica*tions is presented. Finally, a short survey of present-day research* and development efforts in packet broadcasting is presented.
Author (GRA)

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N81-25722 *Texas Univ. at Arlington.*
THE ROLE OF PREPROCESSING IN PROBLEM SOLVING SYSTEMS Ph.D. Thesis
Clive Brandon Dawson 1980 137 p
Avail: Univ. Microfilms Order No. 8109152

The REFLECT problem solving system is developed and described. The declarative problem solving formalism used by the REFLECT system to model information is described. The differences between the declarative and procedural approaches to problem solving are considered. A backwards heuristic search technique based on a variation of the standard state-space graph *termed a goal kernel graph is used. Examples of the performance* of the problem solver without the benefit of preprocessing are presented. The preprocessing phase is described in detail. *Preprocessing techniques which enhance the knowledge about* the world model, and those concerned with the enhancements to the operators used to alter the world model are discussed. *The types of activities which constitute preprocessing are* exemplified. Further applications of the preprocessing technique are discussed. Dissert. Abstr.

N81-25723*# Massachusetts Inst. of Tech., Cambridge. Dept. *of Electrical Engineering and Computer Science.*
PRACTICAL ROBUSTNESS MEASURES IN MULTIVARIABLE CONTROL SYSTEM ANALYSIS Ph.D. Thesis
Norman August Lehtomaki May 1981 278 p refs
(Grant NGL-22-009-124; Contract DE-AC01-78RA-03395)
(NASA-CR-164379; LIDS-TH-1093) Avail: NTIS
HC A13/MF A01 CSCL 09B

The robustness of the stability of multivariable linear time invariant feedback control systems with respect to model uncertainty is considered using frequency domain criteria. *Available* robustness tests are unified under a common framework based on the nature and structure of model errors. These results are derived using a multivariable version of Nyquist's stability theorem in which the minimum singular value of the return difference *transfer matrix is shown to be the multivariable generalization* of the distance to the critical point on a single input, single output Nyquist diagram. Using the return difference transfer matrix, *a very general robustness theorem is presented from which all* of the robustness tests dealing with specific model errors may be derived. The robustness tests that explicitly utilized model *error structure are able to guarantee feedback system stability* in the face of model errors of larger magnitude than those robustness tests that do not. The robustness of linear quadratic *Gaussian control systems are analyzed.* M.G.

N81-25724# Higher Order Software, Inc., Cambridge, Mass.
***FURTHER PROGRESS IN KNOWLEDGE REPRESENTATION* FOR IMAGE UNDERSTANDING Final Report, Sep. 1980 - Mar. 1981**
S. Cushing and L. Vaina Mar. 1981 44 p refs
(Contract N00039-79-C-0457)
(AD-A098416; HOS-TR-28) Avail: NTIS HC A03/MF A01 CSCL 09/2

Attention is focused on three problems implicitly raised in the *October Interim Report*: (1) To provide the basis for and HOS specification of the object-views system (OVS) in terms of which the further development of the system might be expressed; (2) To determine the extent to which a square areal coordinate system can really be used as a basis for image understanding; (3) To determine which formal frameworks for knowledge representation might lend themselves to being useful in dealing with the various subclasses of image-derived information that are relveant to the OVS system. Five basic data types are specified in HOS terms, in response to (1), along with some associated operations. Problems in generalizing the modular-vector arithmetic of square coordinate systems beyond the first two levels of aggregates are discussed in connection with (2). Knowledge-representation frameworks that are deemed to be of potential use in the further development of OVS are listed and discussed. GRA

N81-25725# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.

ON THE REPRESENTATION OF ANGULAR VELOCITY AND ITS EFFECT ON THE EFFICIENCY OF MANIPULATOR DYNAMICS COMPUTATION

William M. Silver Mar. 1981 30 p refs

(Contract N00014-77-C-0389)

(AD-A098418; AI-M-622) Avail: NTIS HC A03/MF A01 CSCL 12/1

Recently there has been considerable interest in efficient formulation of manipulator dynamics, mostly due to the desirability of real-time control or analysis of physical devices using modest computers. The inefficiency of the classical Lagrangian formulations is well known, and this has led researchers to seek alternative methods. Several authors have developed a highly efficient formulation of manipulator dynamics based on the Newton-Euler equations, and there may be some confusion as to the source of this efficiency. This paper shows that there is in fact no fundamental difference in computational efficiency between Lagrangian and Newton-Euler formulations. The efficiency of the above-mentioned Newton-Euler formulation is due to two factors: the recursive structure of the computation and the representation chosen for the rotational dynamics. Both of these factors can be achieved in the Lagrangian formulation, resulting in an algorithm identical to the Newton-Euler formulation. Recursive Lagrangian formulation, resulting in an algorithm identical to the Newton-Euler formulation. Recursive Lagrangian dynamics has been discussed previously by Hollerbach. This paper takes the final step by comparing in detail the representations that have been used for rotational dynamics and showing that with a proper choice of representation the Lagrangian formulation is indeed equivalent to the Newton-Euler formulation. Author (GRA)

N81-25726# Decisions and Designs, Inc., McLean, Va. Social Science Research Inst.

STRUCTURING AND JUDGMENT IN DECISION TECHNOLOGY Final Research Report

Ward Edwards, Richard S. John, and Detlof V. Winterfeldt Jan. 1981 28 p refs Sponsored in part by Decisions and Designs, Inc.

(Contract MDA903-80-C-0194)

(AD-A098617; SSRI-81-4) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report summarizes 15 months of research on the technology of inference and decision, including topics such as: the quality and user acceptance of decision analysis performed by computer vs. analyst; the effect of hierarchical vs. non-hierarchical structures on MAU importance weights and ratings; and the relative impacts of group structure, source reliability, and datum diagnosticity on hierarchical inference judgments. The purpose of this report is to summarize findings and explain how they integrate into an overall program of research on decision technology. GRA

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N81-25727 Minnesota Univ., Minneapolis.

AN IMPROVED MULTI-DIMENSIONAL SPLINE APPROXIMATION BY LOCALIZED BASIS AUGMENTATION Ph.D. Thesis

Merav Chlamtac 1980 143 p

Avail: Univ. Microfilms Order No. 8109403

A method to obtain multilevel spline approximations for multivariate functions or data is described. The implementation is limited to the generation of two level approximation to two dimensional functions. However, the generalization to multilevels of refinement or approximation in more than two dimensions is apparent. The method consists of augmenting a coarse cross product uniform B spline basis by a finer uniform basis, wherever such a refinement is necessary. The coefficients of the desired approximation is obtained in a two step procedure by either discrete l sub 1 or l sub infinity minimization or by interpolation at chosen collocation points. Computational results show that the discrete approximation is preferable to the discrete l sub infinity approximation and that interpolation at the collocation points determined by the l sub 1 approximation method is better than interpolation on a uniform grid. The theoretical aspects of the method are discussed and error bounds are given. A heuristic algorithm based on these results is suggested and its computational implementation is described. Dissert. Abstr.

N81-25728# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).

A CLASS OF VARIANCE-CONSTRAINED PROBLEMS

Moshe Sniedovich May 1980 23 p refs

(CSIR-TWISK-150) Avail: NTIS HC A02/MF A01

A Lagrange multiplier solution procedure is developed for a class of variance constrained problems. The method, based on the separation of the variance and an algorithm for determining the optimal value of the mean, relies on the availability of a method of solving a modified problem in which the variance operator is replaced by the generalized variance operator. It is indicated that the procedure can be used in conjunction with dynamic programming to solve a variety of variance constrained problems which allow the consideration of adaptive strategies. Author

N81-25729# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).

A NUMERICAL SOLUTION TO AN INTERCEPTION PROBLEM

Y. Yavin and G. Reuter Mar. 1980 26 p refs Sponsored in part by Control Data Corp.

(CSIR-TWISK-145) Avail: NTIS HC A03/MF A01

An interception problem is discussed which involves a random motion of two points, M sub e and M sub p, in the x sub 1 x sub 2 plane. The expected velocity of M sub e is at any instant directed to the center of a given disc D sub c in the plane, and its velocity is subjected to a perturbation represented by a Gaussian white noise process. The disc D sub c is contained in a domain D sub o. The point M sub p moves in the plane with velocity v = (v sub 1, v sub 2), where v sub i, i = 1,2 are functions of the positions of M sub e and M sub p. Also given is a subset A of D sub o, where A and D sub c are disjoint. The problem dealt with is to find a velocity control law v(*) for M sub p such that the probability that M sub p intercepts M sub e in A, before M sub e reaches D sub c and before neither M sub e nor M sub p leaves D sub o, will be maximized on a given class of admissible controls. Sufficient conditions on optimal controls of a dynamic programming type, are derived. These conditions require the existence of a smooth solution to a nonlinear partial differential equation, which is solved here by applying a finite difference scheme. Several examples are dealt with numerically. M.G.

N81-25730# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).

ON A DECOMPOSITION OF CONDITIONALLY POSITIVE

SEMIDEFINITE MATRICES
D. H. Martin, M. J. D. Powell (Cambridge Univ., UK), and D. H. Jacobson Jun. 1980 13 p refs Sponsored in part by Control Data
(CSIR-TWISK-156) Avail: NTIS HC A02/MF A01

The necessary and sufficient conditions on a given matrix A under which every A conditionally positive semidefinite matrix Q admits a decomposition of the form Q=A'CA + S (with C strictly copositive and S positive semidefinite) are established. A theorem is proved which states that it is necessary and sufficient that A should possess the closure property together with either the column rank or Slater's property. M.G.

N81-25731# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
THE CHOLESKY FACTORIZATION OF S(-1) IN MULTIPLE REGRESSION
Douglas M. Hawkins and W. J. R. Eplett (Birmingham Univ., UK) Jul. 1980 17 p refs
(CSIR-TWISK-162) Avail: NTIS HC A02/MF A01

The Cholesky lower triangular inverse root (CIR) of the correlation matrix of the dependent and independent variables in a multiple regression problem is shown to be an excellent summary statistic yielding information about the full multiple regression and subsets. In particular, the CIR may be used to select variables and identify alternative subsets. It is also useful for interrelationship analysis. Author

N81-25732# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
AN ADAPTIVE PIECEWISE POLYNOMIAL CURVE FITTING PROCEDURE FOR DATA ANALYSIS
M. Brannigan Aug. 1980 28 p refs
(CSIR-TWISK-168) Avail: NTIS HC A03/MF A01

A wholly adaptive piecewise polynomial curve fitting procedure is presented. Using an information theoretic criterion, the number of knots is estimated necessary to give a good approximation to the underlying function of the data. The optimal positioning of these knots is achieved by a suitable transformation of the constrained nonlinear program. M.G.

N81-25733# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
EQUIVALENCE BETWEEN CONVERGENCE AND STABILITY OF GENERAL NONLINEAR DIFFERENCE SCHEMES
Elemer E. Rosinger Aug. 1980 18 p refs
(CSIR-TWISK-169) Avail: NTIS HC A02/MF A01

An extension to the nonlinear version for the Lax-Richtmyer equivalence between the convergence and stability of linear difference schemes that are consistent with properly posed linear evolution partial differential equations is discussed. It extended in order to accommodate the solutions of nonlinear evolution partial differential equations exhibiting finite 'blow-up' time, which may depend on initial and/or boundary value cond[illegible] M.G.

N81-25734# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
COMPUTATIONAL EXPERIENCE WITH THE SPECTRAL SMOOTHING METHOD FOR DIFFERENTIATING NOISY DATA
M. L. Baart Aug. 1980 20 p refs
(CSIR-TWISK-172) HC A02/MF A01

When applied to nonexact (noisy) data, numerical methods for calculating derivatives, in particular derivatives of order higher than the first, based on model functions fitted to exact data, become unsatisfactory. The spectral smoothing method of Anderssen and Bloomfield entails the choice of an optimal order of the Sobolev norm used as regularizer. This method is used to differentiate, smooth and integrate noisy data. Numerical results suggest that the likelihood function can be minimized not only with respect to the smoothing parameter, but also with respect to the order of the regularizing norm, thus yielding a fully automatic numerical differentiation procedure. Author

N81-25735# Royal Inst. of Tech., Stockholm (Sweden).
STABILITY OF TWO-STEP METHODS FOR VARIABLE INTEGRATION STEPS Interim Report
Werner Liniger, Germund G. Dahlquist (IBM Watson Research Center), and Olavi Nevanlinna (Helsinki Univ. of Technology, Finland) 30 Sep. 1980 34 p refs
(Contract F46920-77-C-0088; AF Proj. 2304)
(AD-A098139; AFOSR-81-0374TR) Avail: NTIS HC A03/MF A01 CSCL 16/1

Two of the most commonly used methods, the Trapezoidal Rule and the two-step backward differentiation formula, both have drawbacks when applied to difficult stiff problems. The Trapezoidal Rule does not sufficiently damp the stiff components and the backward differentiation method is unstable for rapidly varying steps. In this paper we show that there exists a one-parameter family of two-steps, second-order one-leg methods which are stable for any test problem, using arbitrary step sequences. Author (GRA)

N81-25736# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Economics.
A METHOD FOR ESTIMATING DISTRIBUTED LAGS WHEN OBSERVATIONS ARE RANDOMLY MISSING
Melvin J. Hinich and Warren E. Weber Mar. 1981 23 p refs
(Contract N00014-75-C-9494; NR Proj. 042-315)
(AD-A096628; TR-21) Avail: NTIS HC A02/MF A01 CSCL 12/1

A frequency domain technique for estimating distributed lag coefficients (the impulse response function) when observations are randomly missed is presented. The technique treats stationary processes with randomly missed observations as amplitude modulated processes and estimates the transfer function accordingly. Estimates of the lag coefficients are obtained by taking the inverse transform of the estimated transfer function. Results with artificially created data show that the technique performs well even when the probability of an observation being missed is one half and in some cases when the probability is as low as one fifth. The approximate asymptotic variance of the estimator is also calculated. M.G.

N81-25737# Wisconsin Univ. - Madison. Mathematics Research Center.
NUMERICAL Hopf BIFURCATION TECHNIQUES AND THE DYNAMICS OF THE TUBULAR REACTOR MODEL
Robert F. Heinemann and Aubrey B. Poore Nov. 1980 33 p refs
(Contract DAAG29-80-C-0041)
(AD-A096653; MRC-TSR-2136) Avail: NTIS HC A03/MF A01 CSCL 12/1

Numerical bifurcation techniques are developed for studying the multiplicity, stability, and oscillatory dynamics of the nonadiabatic tubular reactor with a single A proceeds to B reaction. The techniques illustrate the existence of one, three, five, or seven steady states and bifurcating periodic solutions. Numerical procedures are presented for computing the Hopf bifurcation formulas which can determine the stability and location of the oscillation without integrating the parabolic partial differential equations. The combination of the Hopf techniques with steady state bifurcation methods enables one to determine all possible steady and stable oscillatory solutions exhibited by distributed parameter models such as the tubular reactor. M.G.

N81-25738# Wisconsin Univ. - Madison. Mathematics Research Center.
DATA SMOOTHING
Guang-Chang Dong (Zhejiang Univ., Hangzhou, China) Dec. 1980 21 p refs
(Contract DAAG29-80-C-0041)
(AD-A096639; MRC-TSR-2151) Avail: NTIS HC A02/MF A01 CSCL 12/1

Data smoothing is the most difficult practical problem confronting Approximation Theory, in part because it is hard to define a satisfactory concept of smoothness mathematically. A spline smoothing method is outlined. The technique is closely modelled on the physical processes used when ship lines are 'faired' or drafted with the aid of wooden splines. In particular, it uses something akin to weight removal and something akin to local flattening in order to achieve its goal of a curve with few inflection points yet close to the given data. S.F.

N81-25739# North Carolina Univ. at Chapel Hill.
FAULTY INSPECTION DISTRIBUTIONS: SOME GENERALIZATIONS

Norman L. Johnson and Samuel Kotz (Maryland Univ., College Park) Apr. 1981 18 p refs
(Contract N00014-81-L-0301)
(AD-A098350; MIMEOGRAPH-SER-1335) Avail: NTIS HC A02/MF A01 CSCL 12/1

In a previous study the authors derived the distribution of the number of items observed to be defective in samples from a finite population, when detection is erroneous with a nonzero probability. The present report extends the previous results by taking into account incorrect identification of nondefectives as well as defectives. Corresponding waiting time distributions are also derived. Furthermore, the case of a stratified finite population corresponding, for example, to defective features of differing severity is considered. Numerical values illustrating the dependence of the corresponding probabilities on the two 'misidentification' parameters are presented. GRA

N81-25740# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Electrical Engineering.
ADAPTIVE ARMA SPECTRAL ESTIMATION
James A. Cadzow and Koji Ogino 1981 8 p refs
(Contract N00014-80-C-0303)
(AD-A098476; Rept-4) Avail: NTIS HC A02/MF A01 CSCL 12/1

A adaptive method for efficiently obtaining an ARMA model spectral estimate of a wide sense stationary time series is presented. It is adaptive in the sense that as an element of the time series is observed, the coefficients of a (p,p)th order ARMA model may be algorithmically updated. This algorithm's computational complexity (i.e., the number of multiplications and additions required) is of the order p log(p) for a particular version of the method. Moreover, the spectral estimation performance of this method is found typically to be far superior to such contemporary approaches as the Box-Jenkins, maximum entropy, and Widrow's LMS methods. This performance in conjunction with its computational efficiency mark this algorithm as being a primary spectral estimation tool. GRA

N81-25741# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Electrical Engineering.
RATIONAL SPECTRAL ESTIMATION: A HIGH PERFORMANCE-FAST ALGORITHMIC PROCEDURE Technical Report, 1 Jan. - 31 Mar. 1981
James A. Cadzow Apr. 1981 40 p refs
(Contract N00014-80-C-0303)
(AD-A098489; TR-6) Avail: NTIS HC A03/MF A01 CSCL 12/1

It is widely recognized that spectral estimation serves as a powerful digital signal processing tool in such diverse areas as radar, array processing, adaptive filtering, seismology, and, speech processing. In this paper, a novel method of rational spectral estimation shall be presented which possesses a number of admirable properties: (1) it has an elegant algebraic structure, (2) its spectral estimation performance has been empirically found to be superior to such contemporary methods as the maximum entropy and Box-Jenkins methods, and (3) it is implementable by a 'fast algorithm', which is computationally competitive with recently developed fast LMS algorithms. Taken in combination, these properties mask this new method as being a primary spectral estimation tool in those challenging applications requiring high performance spectral estimation in a real time setting. The new method is predicated on selecting the parameters of a rational spectral model so that the underlying Yule-Walker equations are best approximated over an extended time span. GRA

N81-25742# Cincinnati Univ., Ohio. Dept. of Aerospace Engineering.
A RELATIONSHIP BETWEEN THEORY AND EXPERIMENT FOR A STATE VARIABLE CONSTITUTIVE EQUATION Interim Report, Sep. 1978 - Oct. 1980
D. C. Stouffer and S. R. Bodner (Technion - Israel Inst. of Technology) Wright-Patterson AFB, Ohio AFWAL Jan. 1981 28 p refs
(Contract F33615-78-C-5199; AF Proj. 2307)
(AD-A098652; AFWALTR-80-4194) Avail: NTIS HC A03/MF A01 CSCL 12/1

A state variable constitutive equation that can be solved for the state variables, can then be used to calculate the state variable histories from the stress and strain histories observed during an experiment. This was done using the Bodner Partom flow equation for cast and wrought Rene 95 at 650 C. The evolution equation was determined for a state variable that characterizes the resistance to plastic flow and some properties of a damage state variable were established. Analysis of the tensile and creep data strongly suggested that two different mechnisms were active during deformation. A limited number of experimental results were compared to the response calculated from the flow and evolution equations. GRA

N81-25743# Florida State Univ., Tallahassee.
ARC-LENGTH CONTINUATION AND MULTI-GRID TECHNIQUES FOR NONLINEAR ELLIPTIC EIGENVALUE PROBLEMS
Tony F. C. Chan and H. B. Keller 19 Mar. 1981 56 p refs Prepared in cooperation with Yale Univ., New Haven and California Inst. of Technology, Pasadena
(Contracts N00014-80-C-0076; DAAG29-78-C-0011; EY-76-S-03-070)
(AD-A098718; Rept-197) Avail: NTIS HC A04/MF A01 CSCL 12/1

We investigate multi-grid methods for solving linear systems arising from arc-length continuation techniques applied to nonlinear elliptic eigenvalue problems. We find that the usual multi-grid methods diverge in the neighborhood of singular points of the solution branches. As a result, the continuation method is unable to continue past a limit point in the Bratu problem. This divergence is analysed and a modified multi-grid algorithm has been devised based on this analysis. In principle, this new multi-grid algorithm converges for elliptic systems arbitrarily close to singularity and has been successfully in conjunction with arc-length continuation procedures on the model problem. In the worst situation, both the storage and the computational work are only about a factor of two more than the unmodified multi-grid methods. Author (GRA)

N81-25744# Illinois Univ. at Urbana-Champaign, Urbana. Dept. of Computer Science.
DIFFERENCE METHODS FOR STIFF DELAY DIFFERENTIAL EQUATIONS
Mitchell Roth Dec. 1980 143 p refs
(Contract DE-AS02-76R-02383)
(DOE/ER-02383/T2; UILU-ENG-80-1747; UIUCDCS-R-80-1012) Avail: NTIS HC A07/MF A01

Delay differential equations that arise in scientific and engineering fields when transport lags and propagation times are physically significant in a dynamic process are discussed. Difference methods for approximating the solution of stiff delay systems require special stability properties that are generalizations of those employed for stiff ordinary differential equations. For linear multistep difference formulas, these properties extend directly from ordinary to delay equations. This straight forward extension is not true for implicit Runge-Kutta methods, as illustrated by the midpoint formula, which is A stable for ordinary equations, but not for delay equations. A computer code for stiff delay equations was developed. DOE

N81-25745# Illinois Univ., Urbana. Dept. of Computer Science.
ITERATIVE SOLUTION OF LINEAR EQUATIONS IN ODE CODES
C. W. Gear and Y. Saad Jan. 1981 36 p refs
(Grant DE-AS02-76ER-02383)
(DOE/ER-02383/0078; UIUCDCS-R-81-1054; UILU-ENG-81-1703) Avail: NTIS HC A03/MF A01

Each integration step of a stiff equation involves the solution of a nonlinear equation, usually by a quasi Newton method that leads to a set of linear problems. Iterative methods for these linear equations are studied. Of particular interest are methods that do not require an explicit Jacobian, but can work directly with differences of function values using J congruent to f(x + delta) - f(x). Some numerical experiments using a modification of LSODE are reported. DOE

N81-25746# Illinois Univ., Urbana. Dept. of Computer Science.

DETECTION AND INTEGRATION OF OSCILLATORY DIFFERENTIAL EQUATIONS WITH INITIAL STEPSIZE, ORDER AND METHOD SELECTION M.S. Thesis
K. A. Gallivan Dec. 1980 70 p refs
(Contract DE-AC02-76ER-02383)
(DOE/ER-02383/T1; UIUCDCS-R-80-1045; UILU-ENG-80-1743) Avail: NTIS HC A04/MF A01

The problem of developing a method of detection for nonstiff and stiff oscillatory behavior in initial value problems is addressed. For this method of detection a control structure is proposed upon which a production code could be based. An experimental code using this control structure is described, and results of numerical tests are presented. DOE

N81-25747# Oak Ridge National Lab., Tenn. Engineering Physics Div.
MATHEMATICAL FOUNDATIONS OF LEAP
E. M. Oblow Apr. 1981 52 p refs
(Contract W-7405-eng-26)
(ORNL-5754) Avail: NTIS HC A04/MF A01

An analysis was made of the mathematical structure of the LEAP energy modeling code. Emphasis was paced on understanding the equations which the code attempts to solve and the iterative numerical algorithm used to achieve a converged solution. The equations were found to be highly nonlinear, similar in form to those found in equilibrium boundary value problems. A combination of a standard nonlinear Gauss-Seidel approach and a modification of Newton's method was used as the basis of an iterative algorithm to find local solutions to the equilibrium equations. Several weaknesses in this approach are discussed, mainly those dealing with the computation of relaxation coefficients in the Newton's method segment of the algorithm. The chief failing of the method as employed in LEAP is the use of a diagonal Jacobian matrix for Newton's method with an ad hoc scheme for calculating the diagonal matrix elements. Most problems encountered had large off diagonal elements leading to a characteristic oscillatory break down in convergence. DOE

N81-25748 Nebraska Univ. - Lincoln.
COMBINATORIAL PROPERTIES OF ALGEBRAIC SETS Ph.D. Thesis
William Warren Krauter, III 1980 56 p
Avail: Univ. Microfilms Order No. 8110574

Those properties of an algebraic set that are determined by its partially ordered set of subvarieties are investigated. These properties are called the combinatorial properties of the algebraic set. Two algebraic sets are combinatorially equivalent (or homeomorphic) if their partially ordered set of subvarieties are isomorphic. All affine surfaces over the algebraic closure of a finite field are classified up to combinatorial equivalence. The combinatorial structure of projective and quasi-projective surfaces is discussed. The combinatorial structure is shown to be more varied than in the affine case. Dissert. Abstr.

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N81-25749 Rensselaer Polytechnic Inst., Troy, N. Y.
GENERAL ROBUST ESTIMATION Ph.D. Thesis
Stephen Philip Harris, Jr. 1980 203 p
Avail: Univ. Microfilms Order No. 8109312

Robust M-estimation procedures are developed for estimating location and scale for the univariate normal distribution, the general linear model, and autoregressive time series models. An estimation procedure is also developed for the general linear model with an infinite variance, stable law, error term. The effects of random coefficients in first order autoregressive models is studied using Monte Carlo simulations and Box-Jenkins time series analysis methods. An estimation procedure is developed with the assumption that the coefficients follow a normal distribution. The two formulations yield estimators which are closely related and very appealing in that allow for the simultaneous estimation of all model parameters. Weights corresponding to each observation are automatically generated which allow for the identification of potential outliers. The procedures are evaluated through Monte Carlo simulations, plots of influence functions, and applications on data. Dissert. Abstr.

N81-25750 Rensselaer Polytechnic Inst., Troy, N. Y.
SELF-CRITICAL AND ROBUST ESTIMATION PROCEDURES FOR A WIDE CLASS OF PROBABILITY MODELS Ph.D. Thesis
Mark Alan Presser 1980 311 p
Avail: Univ. Microfilms Order No. 8109322

Self-critical estimators are robust estimators which incorporate the assumed density function into the estimation process, allowing a degree of communication between the data and the model. Possible problem of discordancy of the fitted model with the data are internally assessed at each step in the estimation, with adaptive correction taken to improve the fit. A coefficient of criticism permits the user to vary the degree to which model assumption are to be scrutinized allowing a tradeoff between robustness and efficiency. Self-critical estimation is shown to be tractable for a wide class of probability models in a variety of different environments. The proposed class of estimation procedures are derived and tested for more complicated models involving concomitant variables. Dissert. Abstr.

N81-25751 Carnegie-Mellon Univ., Pittsburgh, Pa.
STOCHASTIC MODELING AND STATISTICAL INFERENCE FOR COMPARTMENT SYSTEMS Ph.D. Thesis
Percival Kwame Darko 1980 168 p
Avail: Univ. Microfilms Order No. 8107876

Compartment models are used in the modeling and analysis of complex biological and chemical phenomena. The kinetics of a drug or pollutant in a compartment system are modelled using a stochastic model coupled with a diffusion approximation. Stochastic models were developed for compartmental systems with linear transition rates; however, in many applied situations, non-linear transition rates are more appropriate. A non-linear stochastic model motivated by the phenomenon of tissue binding is presented and analyzed. The behavior of the system is characterized using a diffusion approximation. Dissert. Abstr.

N81-25752# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
COMPUTATION OF NASH EQUILIBRIUM PAIRS OF A STOCHASTIC DIFFERENTIAL GAME
Y. Yavin and G. Reuter May 1980 24 p refs Sponsored by Control Data Corp.
(CSIR-TWISK-154) Avail: NTIS HC A02/MF A01

A stochastic differential game is discussed. The problem dealt with is to find a pair of velocity stragegies (u^*,v^*) such that, in the sense of a Nash equilibrium point, the probabilities of certain events will be maximized on a given class of velocity stragegies. Sufficient conditions on (u^*,v^*) are derived which require the existence of a smooth solution to a pair of coupled nonlinear partial differential equations. A finite difference scheme for solving these equations is suggested, and an example is treated in detail. M.G.

N81-25753# Stanford Univ., Calif. Dept. of Statistics.
NEAREST NEIGHBOR CLASSIFICATION OF STATIONARY TIME SERIES: AN APPLICATION TO ANESTHESIA LEVEL CLASSIFICATION BY EEG ANALYSIS
Will Gersch Dec. 1980 29 p refs
(Contract N00014-76-C-0475; NR Proj. 042-267)
(AD-A096952; TR-294) Avail: NTIS HC A03/MF A01 CSCL 12/1

The theory and a prototypic example of an exploratory population screening stationary time series classification problem are presented. In the population screening problem a new individual is classified by comparing measurements obtained from him with measurements obtained from other individuals in the alternative categorical states. Human electroencephalogram (EEG) time series were obtained during surgery simultaneouly with an anesthesiologist's appraisal of the level of anesthesia from a moderate but not large number of individuals. These EEG Time series are considered to be a set of labeled sample time series. The categorical time series classes are characterized by broad intersubject time series variations. An implicit conjecture in this data gathering experiment is that there is sufficient information

in the EEG time series to reliably classify the level of anesthesia of humans in surgery. The separability of the time series populations is assessed. M.G.

N81-25754# Pittsburg Univ., Pa. Inst. for Statistics and Applications.
ON CHARACTERIZING THE MARKOV POLYA DISTRIBUTION
Konanur G. Janardan Feb. 1981 17 p refs
(Contract F49620-79-C-0161; AF Proj. 2304)
(AD-A098565; TR-81-06; AFOSR-81-0378TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

A discrete survival model is considered where an unobservable random variable is subjected to destruction so that what is observed and recorded is only the undamages part X of N. Assuming the destruction process is represented by the Markov-Polya distribution, a characterization of the negative binomial distribution is obtained. Utilizing the completeness property of the negative binomial distribution, a characterization of the Markov-Polya distribution is derived. Several other characterization theorems are also proved concerning these probability distributions. GRA

N81-25755 Louisiana State Univ. and A&M Coll., Baton Rouge.
QUALITY EVALUATION OF SOME COMBINATIONS OF UNIT UNIFORM RANDOM NUMBER GENERATORS AND UNIT NORMAL TRANSFORMATION ALGORITHMS
Win-Yeu Winnie Chen 1980 280 p
Avail: Univ. Microfilms Order No. 8110408

Quality evaluations of several different combinations of unit uniform random number generators and unit normal transformation algorithms for practical applications are studied along with procedures for determining if a given generator or a given combination is 'good' or 'bad'. Major emphasis is placed upon selection of the appropriate statistical tests for this evaluation, and development of the pertinent procedures as well as the corresponding computer programs for these tests. The statistical tests selected as appropriate for evaluating and comparing the quality of various generators are: chi square goodness of fit tests for testing the desired distribution fits and other goodness of fits procedures for use in conjunction with other tests, runs up and down, runs above and below the median, autocorrelation tests, and spectral tests for randomness and independence. Dissert. Abstr.

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N81-25756 Texas Univ. at Arlington.
COMPUTATION OF DIFFERENTIAL GAME SADDLE POINTS USING PARAMETER OPTIMIZATION METHODS Ph.D. Thesis
James Edward Radar 1980 136 p
Avail: Univ. Microfilms Order No. 8109229

The optimal open-loop controls are approximated by polynomials with unknown values of the coefficients. Then, it is shown that the conditions necessary for a saddle point with respect to the open-loop controls are very simple. An example of a two-person, zero-sum game consisting of two aircraft engaged in combat in the vertical plane is presented. The solution of this example for two different values of the final time shows that the suboptimal controls provide good initial guesses for the actual optimal controls. This solution predicts that the longer of the games does not have saddle point solution. The optimal control solution shows that, while the Hamiltonian has a saddle point with respect to the players controls for both values of the final time, a conjugate point exists in the longer game, and the performance index does have a saddle point. This shows that suboptimal methods can be used not only to generate approximate optimal controls but also to predict the existence of saddle points for the differential game. Dissert. Abstr.

N81-25757# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
THE HOMICIDAL CHAUFFEUR GAME: A STOCHASTIC MODEL
M. Pachter and Y. Yavin Jun. 1980 30 p refs Sponsored in part by Control Data Corp.
(CSIR-TWISK-159) Avail: NTIS HC A03/MF A01

A certain stochastic pursuit evasion problem of the homicidal chauffeur type is considered. Specifically, it is shown that, in contrast to the less straightforward swerve manoeuvre employed in the deterministic model, the particularly simple bang-bang pursuit strategy synthesized here is applicable to a significant range of problem parameters. The strategy of the slower but agile player is also characterized and its geometric meaning illustrated. R.C.T.

N81-25758# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MODERN OPTIMAL CONTROL METHODS APPLIED IN ACTIVE CONTROL OF A TETRAHEDRON M.S. Thesis
Alan Michael Janiszewski Dec. 1980 109 p refs
(AD-A094766; AFIT/GS/AA-80D-2) Avail: NTIS HC A06/MF A01 CSCL 12/2

Modern optimal control methods are applied to a lumped mass model of a tetrahedron. The four unit masses of this model are interconnected by isotropic massless rods which are capable of axial deformation only (no bending). System control is achieved via collocated sensor/actuator pairs at three of the four masses. Pointing accuracy at the fourth mass is used as a figure of merit in determining the effectiveness of the controller. A prescribed line of sight response is established as a goal for successful control. The controller is developed using linear optimal techniques which produce feedback gains proportional to the state. The state is represented as modal amplitudes and velocities as determined by the sensors. The four higher frequency modes are truncated to signify a simplifying order reduction step. The feedback gains are established via steady state optimal regulator theory. System response is examined in light of the effects of observation spillover and control spillover onto a specified number of suppressed modes. M.G.

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N81-25759 Stanford Univ., Calif.
AXIOMATIC ANALYSIS AND RELATIVIZATIONS OF RECURSION THEORY Ph.D. Thesis
Robert Steven Winternitz 1981 101 p
Avail: Univ. Microfilms Order No. 8109016

The omega models of the Wagner-Strong axiomatic recursion theory (URS) are studied. The elementary properties of recursive and semirecursive relations which do not follow from URS are considered. These properties are organized under full selection and consistent selection principles. Models are presented. The connection of omega models with recursive is examined. The expressive power of the Wagner-Strong language on the structures of ordinary recursion theory and relativized recursion theory is considered. The relationships between measure independent and recursion theoretic properties of abstract complexity measures are examined. A variation on Turing degree theory is presented. Dissert. Abstr.

N81-25760 Stanford Univ., Calif.
SCATTERING THEORY OF REAL HYPERBOLIC SPACES AND THEIR COMPACT PERTURBATIONS Ph.D. Thesis
Alex Christopher Woo 1981 122 p
Avail: Univ. Microfilms Order No. 8109019

It is shown that the Lax-Phillips approach to scattering theory can be developed for waves on n dimensional real hyperbolic spaces. Using the hyperbolic version of the Radon transforms, outgoing and incoming translation representations for outgoing and incoming data are constructed. The scattering matrix is computed. The Paley-Wiener results of Lax and Phillips are extended to arbitrary real hyperbolic spaces. General wave equations are examined. These equations arise from the Laplace-Beltrami operator of metric which differs from the constant curvature hyperbolic metric on a compact set plus a potential

q(z) which has support in the same compact set. Proofs that there are no eigenvalues embedded in the continuous spectrum and that there are at most a finite number of bound states are given. It is shown that translates of the outgoing subspace for the constant curvature problem are also outgoing for the perturbed problem. the perturbed problem. Outgoing generalized engenfunctions are constructed. Dissert. Abstr.

N81-25761# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
A SURVEY OF THE THEORY OF LINEAR SYSTEMS OVER RINGS
G. Naude and C. Nolte Jun. 1980 27 p refs
(CSIR-TWISK-161) Avail: NTIS HC A03/MF A01

The theory of linear systems over commutative rings is discussed. The realization problem, the descent problem, and the problem of duality are surveyed and an indication is given of the relevant aspects of modern algebra. A power series is associated with a response map and a necessary and sufficient condition is given for a finite realization, viz. the rationality of the associated power series. In this way a purely algebraic characterization is obtained of finite and free realizations. In addition, classes of rings are characterized for which certain system theories hold, it being shown for example that the realization problem over an integral domain R can be reduced to a similar problem over the field of quotients of R if and only if R is a Noetherian integral domain. Morita duality is used in the characterization of the class of rings for which the duality between reachability and observability holds. Other aspects to which attention is given include, for example, the representation of the lattice of minimal realizations as a lattice of submodules of a certain torsion module. M.G.

N81-25762# Arizona Univ., Tucson.
NONPARAMETRIC TEST FOR THE SLOPE OF A TRUNCATED REGRESSION
P. K. Bhattacharya 12 Jan. 1981 22 p refs
(Contract N00014-75-C-0555)
(AD-A096805; TR-22) Avail: NTIS HC A02/MF A01 CSCL 12/1

Approaches to truncated regression problems are examined. In particular, a Kolmogorov-Smirnov test based on sequential ranks for testing H sub o : beta = beta sub o > 0 in analyzing astronomical observations where truncated scatter diagrams (Hubble diagram) are obtained as plots of luminosity distance versus redshift of various celestial objects is discussed. A justification for the procedure is presented. M.G.

N81-25763# Mississippi State Univ., Mississippi State. Engineering and Industrial Research Station.
TENSORS AND DIFFERENTIAL GEOMETRY APPLIED ANALYTIC AND NUMERICAL COORDINATE GENERATION Interim Report
Z. U. A. Warsi Jan. 1981 211 p refs
(Grant AF-AFOSR-0185-80; AF Proj. 2304)
(AD-A096419; AFOSR-81-0197TR; NSSU-FIRS-ASE-81-1; AASE-81-224) Avail: NTIS HC A10/MF A01 CSCL 12/1

The two main objectives of this monograph are, (1) to present and collect at one place some important classical results and concepts from the theories of tensor analysis and differential geometry, and, (2) to use the presented results in devising differential models for generating coordinates in arbitrarily bounded regions. Though most of the discussion on tensors and differential geometry are in the context of curvilinear coordinate generation, the first two parts can profitably be used for applied problems in various branches of engineering both by students and researchers. The last part of the monograph is concerned with the development of two methods, based on differential equations, for the generation of coordinates. The selected models are based on elloptic partial differential equations which can be solved on a computer to provide smooth differentiable coordinate curves in the regions of interest. Author

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

No abstracts in this category.

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N81-25764 Minnesota Univ., Minneapolis.
ACOUSTIC PULSE PROPAGATION IN A CONVERGENT-DIVERGENT DUCT CARRYING A SUBSONIC MEAN FLOW Ph.D. Thesis
Robert Alphonse Handler 1980 175 p
Avail: Univ. Microfilms Order No. 8109442

A convergent-divergent duct consisting of a nozzle section and a conical diffuser section was used along with a broadband pulse with energy in the 60-700 Hz range to determine the effects of duct geometry and throat Mach number on the attenuating properties of the device. Incident, reflected, and transmitted pulses were isolated and their power spectra obtained through the use of the discrete Fourier transform. The results for the case of no mean flow reveal a characteristic resonant frequency (f(0) at f(0) = C/4(L) where C is the sound speed. The transmission coefficients for the case of choked flow show strong attenuation (over the no flow case) for frequencies below f(0). A finite element computation based on the isentropic flow assumption shows that energy is conserved throughout the frequency and mach number range. The computation reveals that the strong attenuation observed for frequencies below f(0) can be interpreted as due to an enchanced and lowered characteristic resonant frequency. Dissert. Abstr.

N81-25765*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ACOUSTIC FACILITIES FOR HUMAN FACTORS RESEARCH AT NASA LANGLEY RESEARCH CENTER: DESCRIPTION AND OPERATIONAL CAPABILITIES
Harvey H. Hubbard and Clemans A. Powell Jun. 1981 15 p refs
(NASA-TM-81975; L-14395) Avail: NTIS HC A02/MF A01 CSCL 20A

A number of facilities were developed which provide a unique test capability for psychoacoustics and related human factors research. The design philosophy, physical layouts, dimensions, construction features, operating capabilities, and example applications for these facilities are described. In the exterior effects room, human subjects are exposed to the types of noises that are experienced outdoors, and in the interior effects room, subjects are exposed to the types of noises and noise-induced vibrations that are experience indoors. Subjects are also exposed to noises in an echo-free environment in the anechoic listening room. An aircraft noise synthesis system, which simulates aircraft flyover noise at an observer position on the ground, is used in conjunction with these three rooms. The passenger ride quality apparatus, a device for studying passenger response to noise and vibration in aircraft, or in other vehicles, is described. S.F.

N81-25766*# Southwest Research Inst., San Antonio, Tex.
ENGINE ISOLATION FOR STRUCTURAL-BORNE INTERIOR NOISE REDUCTION IN A GENERAL AVIATION AIRCRAFT Final Report
James F. Unruh and Dennis C. Scheidt Washington NASA May 1981 164 p refs
(Contract NAS1-14861)
(NASA-CR-3427; SwRI-02-4860) Avail: NTIS HC A08/MF A01 CSCL 20A

Engine vibration isolation for structural-borne interior noise

reduction is investigated. A laboratory based test procedure to simulate engine induced structure-borne noise transmission, the testing of a range of candidate isolators for relative performance data, and the development of an analytical model of the transmission phenomena for isolator design evaluation are addressed. The isolator relative performance test data show that the elastomeric isolators do not appear to operate as single degree of freedom systems with respect to noise isolation. Noise isolation beyond 150 Hz levels off and begins to decrease somewhat above 600 Hz. Coupled analytical and empirical models were used to study the structure-borne noise transmission phenomena. Correlation of predicted results with measured data show that (1) the modeling procedures are reasonably accurate for isolator design evaluation, (2) the frequency dependent properties of the isolators must be included in the model if reasonably accurate noise prediction beyond 150 Hz is desired. The experimental and analytical studies were carried out in the frequency range from 10 Hz to 1000 Hz. M.G.

N81-25767*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ADDITIONAL NOISE DATA ON THE SR-3 PROPELLER

James H. Dittmar and Robert J. Jeracki May 1981 16 p refs

(NASA-TM-81736; E-804) Avail: NTIS HC A02/MF A01 CSCL 20A

The noise generated by supersonic-tip-speed propellers is investigated. An eight bladed propeller was tested in the Lewis 8- by 6-foot wind tunnel with conditions providing data in the subsonic operating region of the propeller. These conditions resulted in a slight reshaping of the curve for blade passing tone as a function of helical tip Mach number as compared with previous results. Directivity curves with an additional transducer position gave an indication of a lobe pattern for this propeller that was not previously observed. The present data at the aft-most position indicate that some reflections, possibly from the test rig support strut, may have affected the data taken previously. M.G.

N81-25768*# *Bolt, Beranek, and Newman, Inc., Cambridge, Mass.*

VALIDATION OF HELICOPTER NOISE PREDICTION TECHNIQUES ***Contractor Report, 1979 - 1981***

George P. Succi Apr. 1981 75 p refs

(Contract NAS1-15740)

(NASA-CR-165715) Avail: NTIS HC A04/MF A01 CSCL 20A

The current techniques of helicopter rotor noise prediction attempt to describe the details of the noise field precisely and remove the empiricisms and restrictions inherent in previous methods. These techniques require detailed inputs of the rotor geometry, operating conditions, and blade surface pressure distribution. The purpose of this paper is to review those techniques in general and the Farassat/Nystrom analysis in particular. The predictions of the Farassat/Nystrom noise computer program, using both measured and calculated blade surface pressure data, are compared to measured noise level data. This study is based on a contract from NASA to Bolt Beranek and Newman Inc. with measured data from the AH-1G Helicopter Operational Loads Survey flight test program supplied by Bell Helicopter Textron. Author

N81-25769# *Pennsylvania State Univ., University Park. Applied Research Lab.*

AN EXPERIMENTAL INVESTIGATION OF OCEAN SEDIMENT EFFECTS UPON LONG-RANGE TRANSMISSION LOSS IN SHALLOW WATER Ph.D. Thesis

John Harold Beebe 9 Dec. 1980 192 p refs

(Contract N00014-79-C-6043)

(AD-A097207; ARL/PSU-TM-80-247) Avail: NTIS *HC A09/MF A01 CSCL 20/1*

Volume absorption was determined experimentally from mode attenuation coefficients measured using explosive sources at sites having varied sediment types. Absorption was predicted using the sedimental models of Biot and Hamilton, and compared with the experimental absorption data. Comparisons between experimental and predicted absorption showed good agreement for three sites having medium to coarse sediments. The Biot model gave the best results for these sites. The best agreement was obtained for a site having a mud bottom where the Biot model gave slightly better results than that of Hamilton over a frequency range of 25 to 250 Hz. Transmission loss was predicted for a site on the Scotian Shelf with a sloping bottom using values of sediment absorption predicted with the sediment models. E.D.K.

N81-25770# Boeing Aerospace Co., Huntsville, Ala. Tactical Missiles Dept.

PROPULSION NOISE REDUCTION TECHNOLOGY PROGRAM Final Report, Apr. 1979 - Sep. 1980

Charles R. Carter and Jerrold H. Arszman (Army Missile Lab., Redstone Arsenal, Ala.) Nov. 1980 214 p

(Contract DAAK40-79-C-0108)

(AD-A094710; TR-RK-CR-81-2; D256-10948) Avail: NTIS HC A10/MF A01 CSCL 19/7

Design, test and analysis of several types of suppressors developed for reducing the peak noise produced by a shoulder fired rocket weapon system are described. Each suppressor design was tested with an actual firing of the M-72 weapon system. A reusable M-72 launch tube was suspended on a ballistic pendulum and each suppressor was attached to the launch tube for testing. Instrumentation for determining missile muzzle velocity, launch tube recoil and near field noise were installed and recorded during each test. An aluminum baffled cylinder suppressor reduces the peak noise produced at the gunners position by the M-72 weapon system from 2.14 psid/177.5 db to 0.46 psid/164 db. This 78.5 percent peak noise overpressure reduction was achieved with no effect on missile muzzle velocity and at a launcher recoil level of 2.86 lb sec. Testing was done with fabric suppressors to determine their potential for fieldweight suppressors. S.F.

N81-25771# *Naval Postgraduate School, Monterey, Calif.*

PROPAGATION OF SOUND IN A FAST BOTTOM UNDERLYING A WEDGE SHAPED MEDIUM M.S. Thesis

Norine A. Bradshaw Sep. 1980 83 p refs

(AD-A094984) Avail: NTIS HC A05/MF A01 CSCL 20/1

The pressure and phase distribution of sound in a fast fluid medium underlying a tapered fluid medium is modeled using a Green's function approach. The model predicts well defined beams in the bottom, with apparent interference effects strongly evident for cases at a distance from the wedge interface. The effects of attenuation on the patterns are studied. A simple expression for determining the beam depression angle as a function the wedge angle, the sound speed ratio, and the density ratio is derived. Comparisons with laboratory measurements are made. M.G.

N81-25772# Army Materials and Mechanics Research Center, Watertown, Mass.

***TIME-DOMAIN PULSE ANALYSIS AS A SUBSTITUTE FOR ULTRASONIC SPECTROSCOPY* Final Report**

Otto R. Gericke Jan. 1981 20 p refs

(*AD-A098385*; AMMRC-TR-81-6) Avail: NTIS HC A02/MF A01 CSCL 14/2

A computer method, based on fast Fourier transformation principles, has been used to study various types of pulsed signals and their associated spectral functions. Theoretical criteria were developed for generating a pulse that exhibits a broad, uniform spectrum while satisfying the practical requirements of the electronic instrumentation currently available for ultrasonic testing purposes. Further investigation was made of how the time-domain appearance of such a broad-spectrum pulse is changed if the signal is subjected to various forms of frequency-dependent attenuation. The results obtained demonstrate the feasibility of establishing a systematic correlation between pulse shape and attenuation function. This leads to the conclusion that ultrasonic attenuation phenomena can be examined by means of a time-domain signal analysis in lieu of the more involved spectrum analysis. Author (GRA)

N81-25773# Texas Univ. at Arlington. Applied Research Labs.

A SUMMARY OF THE RESULTS OF A STUDY OF ACOUSTIC BOTTOM INTERACTION IN A RANGE DEPENDENT *ENVIRONMENT*

Steven R. Rutherford, Susan G. Payne, and Robert A. Koch 14 Nov. 1980 130 p refs

(Contract N00014-78-C-0113)
(AD-A098522; ARL-TR-80-56) Avail: NTIS HC A07/MF A01 CSCL 20/1

This report summarizes the results of research carried out on acoustic bottom interaction in a range variable environment. The major topics treated are adiabatic normal mode modeling in a range variable medium, the role of attenuation in upslope and downslope propagation, and further theoretical studies into the role of mode/mode coupling in a range variable environment. In addition, some possible future directions of work concerning bottom interaction in a range variable environment are described. GRA

N81-25774# Materials Research Labs., Ascot Vale (Australia).
A REVIEW OF SOME PHYSICAL AND CHEMICAL FACTORS AFFECTING THE ATTENUATION OF LOW FREQUENCY SOUND IN SEAWATER
Daniel J. Whelan Jul. 1980 29 p refs
(AD-A097196; MRL-R-782; AR-002-169) Avail: NTIS HC A03/MF A01 CSCL 20/1

An attempt was made to trace the contributions of various physical and chemical factors which effect the low frequency attenuation of sound observed in deep ocean channels and to establish that chemical relaxational processes do in fact contribute to the overall attenuation of this sound. The available evidence indicates that below 0.5 kHz, attenuation is affected predominantly by diffraction and diffusive scattering, but in the range 0.5 to 2.5 kHz, it is the effects of chemical relaxation processes, involving boric acid/borate and magnesium/carbonate equilibrium, which dominate the sound absorption phenomenon. GRA

N81-26001# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
NOISE GENERATED BY VORTEX TUBES DURING THEIR DEVELOPMENT
Robert Legendre *In its* La Rech. Aerospatiale, Bi-Monthly Bull. No. 1980-4 (ESA-TT-672) Mar. 1981 p 3-10 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-4, Jul. - Aug. 1980 p 221-228 Original report in FRENCH previously announced as A80-52913/4 (For primary document see N81-26000 16-99)
Avail: NTIS HC A05/MF A01

N81-26019# *Office National d'Etudes et de Recherches* Aerospatiales, Paris (France).
AEROACOUSTICAL DIAGNOSTICS IN INDUSTRIAL *COMBUSTION*
G. Elias, J. Maulard, A. Ivernel, and J. P. Millour *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-6 (ESA-TT-687) Dec. 1980 p 59-67 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-6, Nov. - Dec. 1980 p 426-436 (For primary document see N81-26015 16-99)
Avail: NTIS HC A05/MF A01

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N81-25775 *North Texas State Univ., Denton.*
A COLLISIONAL MECHANISM IN THE ION-SOLID INTERACTION WHICH ENHANCES SCATTERING YIELDS NEAR *180 DEG Ph.D. Thesis*
Orin Wayne Holland 1980 119 p
Avail: Univ. Microfilms Order No. 8109354

In the course of experiments using uniaxial double alignment channeling to investigate radiation damage in single crystals, an anomalously large ion scattering yield from the near surface of *disordered or simulated disordered solid targets was observed.* The chronology of the discovery of this ion solid effect and its explanation are presented along with experiments detailing the *dependence of the effect upon ion type and energy, as well as* target atomic number and density. Targets included a spectrum of polycrystalline elemental targets in a range Z = 29 to Z = 82. Also, the influence of the effect upon scattering yields from an aligned Au(110) single crystal is demonstrated. The results of measurements are shown to be consistent with the proposed explanation that reversibility of ionic trajectories in solids favors emergent angles near 180 deg and is thus responsible for the enhanced yields. The results of computer simulations of this ion solid interaction are presented along with experimental data for a variety of ion solid combinations. Dissert. Abstr.

N81-25776 Oregon State Univ., Corvallis.
COLLISION PROCESSES OF HIGH RYDBERG STATES IN ATOMIC LITHIUM Ph.D. Thesis
Chester Louis Shepard 1981 225 p
Avail: Univ. Microfilms Order No. 8110005

A thermal beam of lithium atoms emanating from a heated oven and excited to high Rydberg states by pulsed electron impact was studied in order to determine the interaction mechanisms which occur in collisions between high Rydberg atoms and neutral ground state atoms and molecules. In addition, *experiments were performed to observe directly the deflection* of Li^* atoms from the beam. Also n,state population distributions of the Li^* atoms produced by electron impact were obtained by the technique of electric field ionization. These distributions, recorded with various target gases in the vacuum system and with no target gas present, show that the relatively light, highly polar molecules, such as NH3, cause significant n-state changing and ionization in collisions with Li^* atoms. Dissert. Abstr.

N81-25777 Illinois Univ. at Urbana-Champaign.
DIFFACTIVE HADRONIC PRODUCTION OF D MESONS *Ph.D. Thesis*
William Wallace MacKay 1980 154 p
Avail: Univ. Microfilms Order No. 8108594

A search for charmed D mesons was made using a beam of 217 GeV (pi-) incident on a liquid hydrogen target. The trigger required a recoil proton and prompt muon. A total of 50 + or - 12 charged D events were seen in the K + or - (pi(+-),pi(+-)) channels and were split between the two channels in the about *equal amounts. Cuts were made which selected diffractive events,* but when these cuts were removed the signal remained the same although the background was greatly increased. The *Feynman x and angular distributions were consistent with* diffractive production. A diffractive model yields a cross section of (8-10) + 4mu-b. Dissert. Abstr.

N81-25778 Stanford Univ., Calif.
RELATIVISTIC ELECTRON AND PHOTON INTERACTIONS, USING INVERSE CERENKOV, INVERSE SYNCHROTRON AND LIMITED INTERACTION LENGTH EFFECTS AS COUPLING MECHANISMS Ph.D. Thesis
John Addison Edighoffer 1981 93 p
Avail: Univ. Microfilms Order No. 8108920

Three different approaches for coupling relativistic electrons to a focused laser beam are considered. The three effects used are: the inverse Cerenkov; the inverse synchrotron; and the limited *interaction length effects. Other approaches include the free* electron laser and the Smith-Purcell effect. The free electron laser is most sucessful coupling approach is used as a basis for comparision to the three effects studied. Dissert. Abstr.

N81-25779*# *National Aeronautics and Space Administration.* Lewis Research Center, Cleveland, Ohio.
THE SELF-CONSISTENT CALCULATION OF PSEUDO-*MOLECULE ENERGY LEVELS, CONSTRUCTION OF ENERGY* LEVEL CORRELATION DIAGRAMS AND AN AUTOMATED COMPUTATION SYSTEM FOR SCF-X(ALPHA)-SW CALCU-*LATIONS*
Herbert Schlosser (Cleveland State Univ.) Mar. 1981 20 p refs
(NASA-TM-81710; E-740) Avail: NTIS HC A02/MF A01 CSCL 20H

The self consistent calculation of the electronic energy levels of noble gas pseudomolecules formed when a metal surface is bombarded by noble gas ions is discussed along with the *construction of energy level correlation diagrams as a function* of interatomic spacing. The self consistent field x alpha scattered wave (SCF-Xalpha-SW) method is utilized. Preliminary results *on the Ne-Mg system are given. An interactive x alpha* programming system, implemented on the LeRC IBM

370 computer, is described in detail. This automated system makes use of special PROCDEFS (procedure definitions) to minimize the data to be entered manually at a remote terminal. Listings of the special PROCDEFS and of typical input data are given. M.G.

N81-25780*# Cornell Univ., Ithaca, N. Y. Lab. of Atomic and Solid State Physics.

STRUCTURE AND SCREENING IN MOLECULAR AND METALLIC HYDROGEN AT HIGH PRESSURE

D. M. Wood and N. W. Ashcroft Apr. 1981 32 p refs

(Grant NsG-7487)

(NASA-CR-164467; MSC-4460) Avail: NTIS HC A03/MF A01 CSCL 20H

A variational wavefunction is used to express the (spin restricted) Hartree-Fock energy as reciprocal lattice sums for static lattice FCC monatomic hydrogen and diatomic Pa3 molecular hydrogen. In the monatomic phase the hydrogenic orbital range closely parallels the inverse Thomas-Fermi wavevector; the corresponding energy E has a minimum of -0.929 Ryd/electron at r sub s = 1.67. For the diatomic phase E(r sub s) is similar, but the constituent energies, screening, and bond length reflect a qualitative change in the nature of the solid at r sub s = 2.8. This change is interpreted in terms of a transition from protons as structural units (at high density) to weakly interacting models (at low density). Insensitivity of the total energy to a rapid fall in the bond length suggests association with the rotational transition where the rapid molecular orientations characteristic of high pressures disappear and the molecules rotate freely at low pressure. A.R.H.

N81-25781# Tennessee Univ., Knoxville.

SUMMARY QUESTIONNAIRE RESPONSE ON STRUCTURE OF MULTIPLY IONIZED HEAVY IONS AND ASSOCIATED COLLISION PHENOMENA Progress Summary Report, Nov. 1979 - Mar. 1981

I. A. Sellin Mar. 1981 15 p refs

(Contract N00014-75-C-0474; NR Proj. 121-103)

(AD-A096793; Rept-8001) Avail: NTIS HC A02/MF A01 CSCL 20/8

Highly ionized projectiles and collision phenomena between these and neutral atoms, molecules and solid targets is discussed, including highly ionized heavy ions; their modes of formation and destruction in collisions with target atoms and molecules; and the study of electrons and photons ejected by them. Decay of excited states of these ions by radiative and electron emission processes and the study of energy and angle spectra of ejected electrons are the phenomena most often encountered in carrying out these experiments. S.F.

N81-25782# California Univ., Berkeley. Dept. of Chemistry.

CROSSED MOLECULAR BEAM STUDY OF THE REACTIONS OF OXYGEN AND FLUORINE ATOMS Annual Progress Report, 1 Jan. 1980 - 31 Mar. 1981

Yuan T. Lee 30 Mar. 1981 61 p refs

(Contract N00014-75-C-0671)

(AD-A098412; UC-75-C-0671-81) Avail: NTIS HC A04/MF A01 CSCL 20/8

There has been a shift in the direction of this research program during the past year. In order to understand the dynamics of unimolecular dissociation of isolated molecules, a new program on molecular beam photofragmentation translational spectroscopy was initiated. Three projects which have been completed during the last year are summarized (on the photodissociation of Nitromethane at 266 nm; energy splitting between singlet and triplet methylene by photodissociation of ketene; and frequency dependence of quantum state distributions of photofragments of ozone). All three projects involve the dissociation through electronic excitation. In the coming years, the dynamics of dissociation of energetic molecules through ground electronic states will be investigated using infrared multiphoton excitation processes. Author (GRA)

N81-25783# Oak Ridge National Lab., Tenn.

WMIN: A COMPUTER PROGRAM TO MODEL MOLECULES AND CRYSTALS IN TERMS OF POTENTIAL ENERGY FUNCTIONS

William R. Busing Apr. 1981 172 p refs

(Contract W-7405-eng-26)

(ORNL-5747) Avail: NTIS HC A08/MF A01

The computer program WMIN which can be used to manipulate static and dynamic models of crystals or isolated molecules and to calculate their energies from interatomic potential functions is described. It is applicable to a wide variety of substances ranging from ionic crystals to large organic molecules. A description of the program, instructions for data input, a program listing, and the output from test problems are included. DOE

N81-25784# Kansas State Univ., Manhattan. Dept. of Physics.

ATOMIC PHYSICS OF STRONGLY CORRELATED SYSTEMS Progress Report, 1 Aug. 1980 - 31 Jul. 1981

C. D. Lin Mar. 1981 55 p refs

(Contract DE-AC02-79ER-10514)

(DOE/ER-10514/12) Avail: NTIS HC A04/MF A01

Electron correlations of doubly excited electrons in hyperspherical coordinates, and differential and total cross sections for charge transfer and ionization in fast ion atom collisions are discussed. DOE

N81-25785# Minnesota Univ., Minneapolis.

NUCLEAR-STRUCTURE STUDIES WITH PIONS AND HEAVY IONS Progress Report, 1 Jun. 1980 - 31 May 1981

D. Dehnhard Mar. 1981 58 p refs

(Contract DE-AS02-79ER-10423)

(DOE/ER-10423/T2) Avail: NTIS HC A04/MF A01

Nuclear structure studies with pions, light ions, and heavy ions are described. The energetic pion channel and spectrometer and the high resolution spectrometer were used in the studies. E.D.K.

N81-25786# Wisconsin Univ., Madison.

UNIMOLECULAR DECAY DYNAMICS OF INTERNAL ENERGY SELECTED MOLECULES Technical Progress Report

1980 8 p refs

(Contract DE-AC02-80ER-10755)

(DOE/ER-10755/T1) Avail: NTIS HC A02/MF A01

Direct excitation of overtone vibrations in combination with time resolved spectroscopic detection probes unimolecular processes in new detail. Observing product luminescence produced by the decay of tetramethyldioxetane excited to v = 3, 4, or 5 of the CH stretching vibration yields the unimolecular decay rate directly, provides overtone vibration spectra on a low pressure gas phase molecule, and reveals a new feature to the chemiluminescence kinetics. Laser induced fluorescence experiments to extend this work to include product state detection are in preparation. DOE

N81-25787# Paris XI Univ., Orsay (France). Inst. de Physique Nucleaire.

REMARKS ON THE SPIN-ROTATION PARAMETER IN ELASTIC PROTON-NUCLEUS SCATTERING

J. P. Auger and R. J. Lombard Feb. 1980 30 p refs

(IPNO-TH-80-06) Avail: NTIS (US Sales Only) HC A03/MF A01

The properties of the spin rotation parameter Q in the case of elastic proton nucleus scattering at intermediate energies are studied. In particular, attention is focussed on the possibility of using measurements of P and Q at low momentum transfer to extract information on the real part of the spin independent nucleon-nucleon amplitude and to check in this way simple models. DOE

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N81-25788# RAND Corp., Santa Monica, Calif.

THE HIGH TEMPERATURE GAS-COOLED REACTOR: AN

OVERVIEW OF SAFETY ISSUES
Kenneth A. Solomon and Steven L. Salem Dec. 1980 83 p
Sponsored by Gas Cooled reactors
(RAND/N-1589-GCRA) Avail: NTIS HC A05/MF A01

The inherent safety of the high temperature gas-cooled reactor concept (HTGR) is examined with emphasis on accidents and accident risks. Implications of the accident at the Three Mile Island light water reactor (LWR) on HTGR design are assessed. In terms of environmental impact, the HTGR is found to offer about 25% less thermal pollution and roughly the same radiological effluents as the LWR. To the extent that noncommensurables can be compared, the HTGR offers some generic safety features over the LWR. The inert, single phase, moderate coolant (helium) and high temperature heat capacity core and moderator of the HTGR combine to provide more time ro respond to core heat accidents than does the LWR. The same need exists for stricter operator training, additional reliability and safety analysis requirements, additional siting studies, and additional emergency preparedness measures. A.R.H.

N81-25789# California Univ., Livermore. Lawrence Livermore Lab.
ENERGY AND TECHNOLOGY REVIEW
Richard B. Crawford, ed., Mary Ann Esser, ed., and Kent Madsen, ed. *Jan. 1981 34 p refs*
(Contract W-7405-eng-48)
(UCRL-52000-81-1) Avail: NTIS HC A03/MF A01

It was discovered that intense, monochromatic, polarized X-rays are emitted in a strongly forward bunched beam when ultrarelativistic positrons or electrons travel along a crystal plane or axis. *The LLLNL rainout project used computer modeling to* study the effect of electrical interactions in clouds on the scavenging of nuclear debris from the atmosphere by rain. Recently developed technology to increase engineering productivity makes it possible to produce better designs in less time and with fewer design iterations. DOE

N81-25790# Los Alamos Scientific Lab., N. Mex.
PHASE AND BUNCH SHAPE MEASUREMENT IN THE UNILAC WITH CAPACITIVE PROVES
J. Glatz, H. J. Keller, and P. Strehl Dec. 1980 20 p *refs Transl. into ENGLISH from GSI 73-1 (West Germany), Feb. 1973* 21 p
(Contract W-7405-eng-36)
(LA-tr-80-42) Avail: NTIS HC A02/MF A01

A procedure for monitoring the phase position of the centers of the particle packages relative to the RF phase using capacitive probes is studied. (GHT) Topics covered include time resolution of the measuring electronics, calculation of the course of the signal, and estimation of the signal amplitude. Calculated signal flows for a bunch with homogeneous charge distribution and a cylindrical capacitance probe with various dimensions are depicted graphically. DOE

N81-25791# Oak Ridge National Lab., Tenn.
THORIUM RESONANCE-NEUTRON CAPTURE (2.6 TO 10 KEV)
R. L. Macklin Mar. 1981 20 p *refs*
(Contract W-7405-eng-26)
(ORNL/TM-7732) Avail: NTIS HC A02/MF A01

Individual resonance parameters are fitted to thorium neutron capture data up to 10 keV. The ENDF/B-V resonance parameters (given up to 4 keV) do not describe the data well. An average radiation width GAMMA/sub (BETA)/ = 25.5 + or - 1.2 meV is derived together with fitted strength functions. DOE

N81-25792# Georgia Univ., Athens. Dept. of Physics.
LIGHT-PARTICLE AND GAMMA-RAY EMISSION MEASUREMENT IN HEAVY-ION REACTIONS ***Progress Report, 1 Jun. 1980 - 31 May 1981***
G. A. Petitt 1981 13 p refs
(Contract DE-AS05-80ER-10418)
(DOE/ER-10418/T1) Avail: NTIS HC A02/MF A01

A summary of research activities studying heavy-ion reactions is presented. Reactions studied include (16)o + (93)NB at 208 Mev; and (12)C + (158)Gd and (13)C = (157)Gd at 100 - to 200 Mev. DOE

N81-25793# Los Alamos Scientific Lab., N. Mex.
SPACE NUCLEAR SAFETY AND FUELS PROGRAM ***Progress Report, Jan. 1981***
S. E. Bronisz, comp. Apr. 1981 19 p refs
(Contract W-7405-eng-36)
(LA-8824-PR) Avail: NTIS HC A02/MF A01

Studies related to the use of (Pu-238)O2 in radioisotopic power systems are described. The general purpose heat source (GPHS) module is discussed in relation to impact tests, fuel breakup, reentry tests, and GPHS compatibility and vent performance tests. Topics concerning safety technology include helium release, enhanced ductility fuel, and test pellets. E.D.K.

N81-25794# Sandia Labs., Albuquerque, N. Mex.
PARTICLE-BEAM-FUSION Progress Report, Jul. - Dec. 1979
Jan. 1981 153 p refs
(Contract DE-AC04-76DP-00789)
(SAND-80-0974) Avail: NTIS HC A08/MF A01

Topics covered include: (1) fusion target studies; (2) target experiments; (3) particle beam source developments; (4) particle beam experiments; (5) pulsed power; (6) pulsed power applications; and (7) the electron beam fusion accelerator project. DOE

N81-25795# Los Alamos Scientific Lab., N. Mex.
APPLIED NUCLEAR DATA RESEARCH AND DEVELOPMENT Progress Report, 1 Oct. - 31 Dec. 1980
C. I. Baxman, comp. and P. G. Young, comp. Mar. 1981 55 p *refs*
(Contract W-7405-eng-36)
(LA-8757-PR) Avail: NTIS HC A04/MF A01

The theory and evaluation of nuclear cross sections, nuclear cross section processing, and fission products and actinides are discussed. Other topics include yields, decay data, depletion, and buildup. DOE

N81-25796# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Kernphysik.
NUCLEAR STRUCTURE APPROACH TO THE CALCULATION OF THE IMAGINARY ALPHA-NUCLEUS OPTICAL POTENTIAL
H. Dermawan, F. Osterfeld (Oregon State Univ., Corvallis), and V. A. Madsen 1981 29 p refs
(Contract DE-AT06-79ER-10405)
(DOE/ER-10405/2) Avail: NTIS HC A03/MF A01

A microscopic calculation of the second order imaginary optical potential for Ca-40(alpha, alpha) is made for incident energies of 31 and 100 MeV using RPA transition densities for intermediate excited states. The projectile is treated as an elementary particle, and the alpha nucleon interaction is normalized. The use of an optical Green's function for the intermediate propagator is found to be important. Equivalent local potentials are obtained and used to calculate elastic scattering cross sections. Agreement with low angle experimental data is fair at 31 MeV, but at 100 MeV the calculated cross sections indicate much too little absorption. DOE

74 OPTICS

Includes light phenomena.

N81-25797 Rensselaer Polytechnic Inst., Troy, N. Y.
THE PERCEPTION OF MODERATE COLOR DIFFERENCES ***IN SURFACE COLOR SPACE Ph.D. Thesis***
Danny Clark Rich 1980 237 p
Avail: Univ Microfilms Order No. 8109324

A technique for direct determination of the parameters of color difference perceptibility ellipses for supra-threshold surface color differences was developed. Two surface color centers were selected. One was a vivid greenish yellow painted paper and the other was a deep greenish blue painted paper. Three color difference levels were developed at approximately 0.5, 1.0, and 15 CIEL $L^*a^*b^*$ color difference units. The results show little

or no significant changes in the angular orientations of the ellipses as a function of the size of the color difference. Changing the standard observe produced significant differences in the blue region, but not in the yellow region. Angular orientations of the color difference preciptibility ellipses were compared to the predictions of MacAdam's perceptibility data and the CIEL*a*b color difference equation. The ellipses were most like the MacAdam data in the yellow region and most like the CIEL*a*b predictions in the blue region. The ellipses for both color centers were graphically compared to the spacing of the Munsell color-order system. Dissert. Abstr.

N81-25798# Naval Postgraduate School, Monterey, Calif.
A PULSE CODE MODULATED FIBER OPTIC LINK DESIGN FOR QUINAULT UNDER-WATER TRACKING RANGE M.S. Thesis
David Allen Andersen (Coast Guard) Sep. 1980 91 p refs
(AD-A094985) Avail: NTIS HC A05/MF A01 CSCL 17/2

An underwater fiber optics communication link shown to be realistic alternative to the currently planned coaxial cable link for a shallow-water torpedo tracking range. The currently planned system is reviewed and a fiber optic alternative is discussed. From several possible modulation techniques that were studied and compared, pulse code modulation was chosen. A fiber optic link, built and tested using a microprocessor controlled signal simulator, including signal format, optical transmission and reception. A.R.H.

N81-25799# Naval Ocean Systems Center, San Diego, Calif.
FIBER-OPTIC COMMUNICATION LINKS FOR UNMANNED INSPECTION SUBMERSIBLES
S. J. Cowan, P. J. Heckman, and Michael Kono 15 Oct. 1980 57 p refs
(AD-A096454; NOSC/TR-652) Avail: NTIS HC A04/MF A01 CSCL 17/2

An expendable optical fiber data link is proposed as a means to provide the wide bandwidth, high quality, bidirectional communications essential to advanced sensor/real time man in the loop capabilities of undersea inspection vehicles. The specific areas addressed include deployment, spool winding, modulation and multiplexing, and optical interfacing to underwater electronic pressure housings. M.G.

N81-25800# Kansas State Univ., Manhattan. Dept. of Physics.
TIME-RESOLVED RAMAN SCATTERING AND TRANSMISSION MEASUREMENTS DURING PULSED LASER ANNEALING
A. Compaan, H. W. Lo, A. Aydinli, and M. C. Lee 1980 7 p refs
(Contract N00014-80-C-0419)
(AD-A098184) Avail: NTIS HC A02/MF A01 CSCL 20/6

Raman scattering from a 7 nsec pulsed dye laser has been used to determine the onset of recrystalization following an 8 nsec dye laser excitation pulse in ion-implanted silicon. We find essentially complete recrystallization 59 nsec after the first excitation pulse and from Stokes-anti-Stokes ratios we find at 59 nsec a crystalline lattice temperature of 600 + or - 200 C. Time-resolved transmission measurements at lambda = 1.15 microns also demonstrate that no molten phase has occurred even though the usual reflectivity enhancement is observed. Author (GRA)

N81-25801# Lincoln Lab., Mass. Inst. of Tech., Lexington. Group 92.
DISCRIMINATION FEATURES AND SPECIFICATIONS FOR OPTICAL DECOYS
Bernard J. Burdick 2 Jan. 1981 34 p
(Contract F19628-80-C-0002)
(AD-A098715; TR-547; ESD-TR-80-237) Avail: NTIS HC A03/MF A01 CSCL 17/8

The formulation of optical signature features useful in discrimination studies and decoy design, and a method for evaluating a decoy's effectiveness are presented in this report. These features are based on an optical signature model which incorporates a second-order trend with a sinusoidal-type variation normally observed in optical signatures. The decoy evaluation procedure presented here provides the decoy designer with an analysis of those features and wavebands of the decoy signature which may need modification to achieve a prescribed match with an RV. Author (GRA)

N81-25802# Naval Ocean Systems Center, San Diego, Calif.
MANUFACTURING TECHNOLOGY PROGRAM. FIBER OPTIC MULTIPIN HYBRID CONNECTOR Final Report, Nov. 1977 - Mar. 1980
G. M. Holma and R. A. Greenwell 17 Dec. 1980 62 p refs
(AD-A098680; NOSC/TR-648) Avail: NTIS HC A04/MF A01 CSCL 20/6

The connector developed was Amphenol's 801 series multichannel bundle connector. The design consisted of adapting fiber optic bundle contacts to have the same external dimensions as an existing electrical contact for a multipin electrical connector. This was accomplished with a size 12 fiber optic contact, which fit into an unmodified MIL-C-26482G multipin electrical connector shell. This approach was compatible with the desired goal of the program. The connector shell was an already approved, tested MIL-SPEC component with off-the-shelf availability. The contacts can be mass-produced on automatic screw machines. This same principle was used in Amphenol's 801 series single fiber connector. The strength member attachment had to be designed so as not to interfere with the scheme for optical contact retention, which was identical to that for electrical contact retention. The connector can accommodate any combination of a total of eight wire or fiber optic bundle contacts in a quick-disconnect, size 18 shell, MIL-C-26482G series 2, class L, fluid resistant connector. The connector developed under contract met all the initially established requirements. GRA

N81-25803# Science Applications, Inc., Huntsville, Ala.
HWIL IR IMAGING TESTING Final Report, 10 Nov. 1980 - 31 Mar. 1981
Ray J. Vinson and Rufus D. Passwater 31 Mar. 1981 25 p refs
(Contract DAAK40-78-D-0011)
(AD-A098547; SAI-82-553-HU) Avail: NTIS HC A02/MF A01 CSCL 17/5

The Army simulator facilities are presently configured to conduct hardware-in-the-loop mission tasks on the HELLFIRE and COPPERHEAD missile systems. These systems presently use a LASER seeker. The facility is an ideal candidate to be converted to include infrared (IR) seekers used on the TGSM system. This study investigates the possibility and impact of a facility update. This report documents the feasibility of developing a hardware-in-the-loop (HWIL) hybrid simulation incorporating infrared IR seekers used for the Assault Breaker program. Other hardware to be considered are the autopilot, signal conditioning, signal processing, and actuators which may be integrated into the system simulation. Considerations are given to replacing all or elements of hardware while substituting math models in the system simulation. Author (GRA)

N81-26004# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
INFRARED IMAGING SYSTEMS: OPERATING PRINCIPLES, TESTS, UTILIZATION
Georges Gauffre and Jean-Claude Fontanella *In its* La Rech. Aerospatiale, Bi-Monthly Bull. No. 1980-4 (ESA-TT-672) Mar. 1981 p 45-55 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-4, Jul. - Aug. 1980 p 259-269 Original report in FRENCH previously announced as A80-52916/4 (For primary document see N81-26000 16-99)
Avail: NTIS HC A05/MF A01

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N81-25804 Yale Univ., New Haven, Conn.
DETERMINISTIC AND DIFFUSIVE MASS TRANSFER MECHANICS IN THE CAPTURE OF VAPORS AND

PARTICLES Ph.D. Thesis
Juan FernandezdelaMora 1980 233 p
Avail: Univ. Microfilms Order No. 8109661

Several analytical methods, some classical and some new, are employed to study the motion of dilute mixtures of particles or heavy molecules in a host gas. The phenomenon of particle phase compressibility is illustrated. Phenomenological expressions, giving the particle velocity drift as a function of local fluid properties only are found. An analytical solution to the problem of the large Reynolds number motion of a dusty gas near the forward stagnation point of a cylinder in crossflow is derived, including inertial, diffusive (thermal and Brownian) and centrifugal effects. The analogous problem of a sphere in a low Reynolds number flow is also solved in the absence of thermophoresis. The generalized phenomenological laws obtained in the particle limit are extended to the case of non negligible Fick diffusivity (heavy molecule limit) with the help of a Fokker-Planck kinetic equation. Dissert. Abstr.

N81-25805# Academy of Sciences (USSR), Moscow. Space Research Inst.
MAIN CHARACTERISTICS OF THE BEAM-PLASMA DISCHARGE IN ROCKET EXPERIMENTS: LABORATORY STUDIES
A. Kiraga, L. Yu. Kochmarev, Z. Kloss, Z. Kravchic, A. N. Laliashvili, N. A. Leonov, S. B. Lyakhov, A. D. Mairov, G. G. Managadze, O. A. Povazyaev et al 1981 45 p refs
(Rept-617) Copyright. Avail: Issuing Activity

Laboratory results obtained from the study of beam plasma discharges (BPD) with a characteristic scale of several meters in the homogeneous atmosphere and in the neutral gas jet are reviewed. The considered BPD parameters include glow intensity, the values of electromagnetic fields and their spectral distribution, concentration and temperature of electrons in the plasma, and fluxes of scattered electrons. The thresholds of BPD ignition are determined using the neutral gas pressure and the beam parameters. The initial stage of BPD formation is studied as well as the various types of oscillatory processes in a discharge. Author

N81-25806# Academy of Sciences (USSR), Moscow. Space Research Inst.
PLASMA TURBULENCE AND DISSIPATION OF STRONG ELECTROMAGNETIC WAVE NEAR THE QUARTER CRITICAL DENSITY
R. Z. Sagdeev, G. I. Soloviev, V. D. Shapiro, V. I. Shevchenko, and I. U. Yusupov 1981 28 p refs
(Rept-610) Copyright. Avail: Issuing Activity

The plasma turbulence in the isotropic plasma associated with dissipation of strong electromagnetic wave near the quarter critical density is considered. The theory of quasi-stationary turbulence is developed where the energy fed to plasma waves due to parametric decay instability of the pump is then transferred to shorter wave lengths and finally is absorbed due to Landau damping. The effective collision frequency characterizing the absorption rate of energy from the pump and power absorbed by the plasma turbulence are determined. Numerical simulations were used to investigate plasma turbulence at pump fields near twice the plasma frequency. E.D.K.

N81-25807*# Rice Univ., Houston, Tex. Dept. of Space Physics and Astronomy.
THE SIMULATION OF THE GEOSYNCHRONOUS EARTH ORBIT PLASMA ENVIRONMENT IN CHAMBER A: AN ASSESSMENT OF POSSIBLE EXPERIMENTAL INVESTIGATIONS Final Report
William Bernstein Jan. 1981 27 p refs
(Contract NAS9-16166)
(NASA-CR-160997) Avail: NTIS HC A03/MF A01 CSCL 20I

The possible use of Chamber A for the replication or simulation of space plasma physics processes which occur in the geosynchronous Earth orbit (GEO) environment is considered. It is shown that replication is not possible and that scaling of the environmental conditions is required for study of the important instability processes. Rules for such experimental scaling are given. At the present time, it does not appear technologically feasible to satisfy these requirements in Chamber A. It is, however, possible to study and qualitatively evaluate the problem of vehicle charging at GEO. In particular, Chamber A is sufficiently large that a complete operational spacecraft could be irradiated by beams and charged to high potentials. Such testing would contribute to the assessment of the operational malfunctions expected at GEO and their possible correction. However, because of the many tabulated limitations in such a testing programs, its direct relevance to conditions expected in the geo environment remains questionable. J.M.S.

N81-25808*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
GOALS OF THERMIONIC PROGRAM FOR SPACE POWER
Robert E. English 1981 11 p refs Presented at the Plasma Sci. Intern. Conf., Santa Fe, N. Mex., 18-20 May 1981; sponsored by IEEE
(NASA-TM-82616; E-868) Avail: NTIS HC A02/MF A01 CSCL 20I

The thermionic and Brayton reactor concepts were compared for application to space power. For a turbine inlet temperature of 15000 K the Brayton powerplant weighted 5 to 40% less than the thermionic concept. The out of core concept separates the thermionic converters from their reactor. Technical risks are diminished by: (1) moving the insolator out of the reactor; (2) allowing a higher thermal flux for the thermionic converters than is required of the reactor fuel; and (3) eliminating fuel swelling's threat against lifetime of the thermionic converters. Overall performance can be improved by including power processing in system optimization for design and technology on more efficient, higher temperature power processors. The thermionic reactors will be larger than those for competitive systems with higher conversion efficiency and lower reactor operating temperatures. It is concluded that although the effect of reactor size on shield weight will be modest for unmanned spacecraft, the penalty in shield weight will be large for manned or man-tended spacecraft. E.A.K.

N81-25809# Nagoya Univ. (Japan). Inst. of Plasma Physics.
SIMULATION FOR IMPLOSION OF HOLLOW SHELL TARGET BOMBARDED BY PROTON BEAM
Shigeo Kwata and Keishiro Niu Feb. 1981 21 p refs
(IPPJ-502) Avail: NTIS HC A02/MF A01

A one dimensional hydrodynamic code 'Mt. FUJU' was developed and used to simulate the implosion motion of a hollow shell target. The code includes special processes occurring in the target such as fuel depletion caused by fusion reactions and reabsorption of neutrons, alpha particles and photons which are produced in the target, as well as the ordinary processes, for instance, depositions of energy, momentum and mass of impinging light ion beams. The simulation shows that a pellet gain of more than 90 can be attainable in an adiabatic compression of the fuel provided that the pellet has the optimum amount of D-T fuel and the fuel velocity exceeds 10 to the 7th power cm/sec at the pellet implosion. Author

N81-25810# Nagoya Univ. (Japan). Inst. of Plasma Physics.
RF CURRENT DRIVE IN A TOKAMAK PLASMA BY THE LOWER HYBRID WAVE IN JIPP T-2
K. Ohkubo, S. Takamura, K. Kawahata, T. Tetsuka, K. Matsuura, N. Noda, K. Sakurai, S. Tanahashi, and J. Fujita Mar. 1981 6 p refs Presented at the 4th Topical Conf. on Radio Frequency Plasma Heating, Austin, Tex., Feb. 1981
(IPPJ-514) Avail: NTIS HC A02/MF A01

A current driven by injecting the lower hybrid wave was observed in a Tokamak of low density. It is confirmed that RF-driven current is generated by momentum transfer of the lower hybrid wave propagating with small parallel refractive index to runaway electrons beyond the critical velocity. The efficiency of the current generation is 1 kA/kW with an RF power of 40 kW. When cyclotron emission due to RF-driven runaway electrons increases suddenly, spikes and bursts in loop voltage and X-rays appear coincidentally. In long rf pulse, these rapid changes progress to relaxation oscillations. It is concluded that the pulsating changes originate in the instantaneous scattering of runaway electrons by the unstable waves excited at the anomalous Doppler resonance. Author

N81-25811# Nagoya Univ. (Japan). Inst. for Plasma Physics.
TEST STAND FOR MAGNETRON H NEGATIVE ION SOURCE AT IPP-NAGOYA
H. Okamura, T. Kuroda, and A. Miyahara Feb. 1981 22 p refs
(IPPJ-T-33) Avail: NTIS HC A02/MF A01

Test facilities for the development of magnetron H(-) ion source consists of the vacuum system, power supplies, diagnostic equipment, and their controlling electronics. Schematics are presented and relevant items described including sequence control, optical links, the charged pulse forming network, the extractor power supply, magnet power supply, temperature control of the cesium feeder, and the pulsed valve driver. Noise problems and diagnostics are also considered. A.R.H.

N81-25812# Nagoya Univ. (Japan). Inst. of Plasma Physics.
DEFLAGRATION WAVE WITH RADIATIVE ENERGY TRANSPORT
Moritake Tamba and Keishiro Niu Feb. 1981 17 p refs
(IPPJ-508) Avail: NTIS HC A02/MF A01

Numerical calculations were carried out to analyze spatial structures of stationary deflagration waves formed in slab targets. In the analysis, radiative energy transport is taken into account. Profiles of radiative energy flux differ depending on the states of the outer layer material of the target (solid or plasma). However, radiative energy transport plays a negligible role in deflagration wave structures formed by a light ion beam. Author

N81-25813# Nagoya Univ. (Japan). Inst. of Plasma Physics.
IMPURITY SHEATH FORMATION SCENARIO FOR PLASMA EDGE COOLING
K. Ikuta and J. Hatori Feb. 1981 13 p refs
(IPPJ-507) Avail: NTIS HC A02/MF A01

An edge cooling scheme using a standard metal limiter together with the radio frequency field for pumping out the metal impurity is considered. During the pumping out process the metal impurity ejected from the limiter enhances the radiation cooling in the plasma periphery without impurity accumulation in the hot core plasma. The impurity is thus called a sheath limiter. M.G.

N81-25814# Nagoya Univ. (Japan). Inst. of Plasma Physics.
IMPURITY BEHAVIOR BEFORE AND DURING THE RISE OF THE ELECTRON DENSITY IN JIPP T-2 TOKAMAK PLASMA
M. Sato, T. Amano, K. Sato, and K. Miyamoto Feb. 1981 34 p refs
(IPPJ-506) Avail: NTIS HC A03/MF A01

Resonance lines for oxygen and iron ions in JIPP T-II Tokamak plasma are measured before and during the rise of the electron density. Spatial profiles of volume emissivities of OVII, FeXII and FeXVI are obtained. The comparison of experimental and computational results is made by using a one dimensional impurity transport code. The code assumes oxygen influx by the desorption due to charge exchanged hydrogen neutrals hitting the wall and iron influx by self recycling. The increment of oxygen influx results in the increments of oxygen line intensities during the rise of electron density due to gas puffing, and the enhanced ionization process due to the increased electron density results in the outward movement of the peak position of volume emissivity of OVII. It is surmised that the diffusion of oxygen ions is dominated by anomalous diffusion while diffusion of iron ions is affected by both the neoclassical and anomalous diffusion. Author

N81-25815# Nagoya Univ. (Japan). Inst. of Plasma Physics.
STUDY OF EFFECTS OF IMPURITY IONS AND NEUTRAL ATOMS ON REVERSED-FIELD PINCH BY 2-D MHD PINCH SIMULATION
A. Nagata, H. Ashida, M. Okamoto, Y. Hirano, Y. Maejima, T. Shimada, and K. Ogawa Feb. 1981 32 p refs
(IPPJ-505) Avail: NTIS HC A03/MF A01

The two dimensional MHD pinch simulation code, TOPICS, which includes the effects of the impurity ions, the neutral atoms and anomalous resistivity, is applied to the investigation of the reversed field pinch plasmas at the setting-up phase of the TPE-1R. Simulations are compared with the typical two cases of the experiment: (1) the lower initial bias field and the higher plasma current density and (2) the higher initial bias field and the lower plasma current density. The magnetic field profiles at the setting-up phase in the experiments can be failry well explained by the simulation assuming the 50% ionization degree of the initial plasma and the presence of 10% oxygen. It is also found from the simulation that the radiation loss due to 5 to 10% impurities is the dominant electron energy loss mechanism. The toroidal magnetic field profile at the setting-up phase calculated by using the isotropic anomalous resistivity is much narrower than that by the classical resistivity. M.G.

N81-25816# Nagoya Univ. (Japan). Inst. of Plasma Physics.
SPECTROSCOPIC DETERMINATION OF ION DENSITY RATIO n(He ++)/n(He+) IN AN MPD ARCJET PLASMA
K. Matsunaga, T. Hara, S. Kishimoto, and M. Inutake Feb. 1981 27 p refs
(IPPJ-504) Avail: NTIS HC A03/MF A01

The relative intensity of the He II line (4686 A) to the triplet line of He I (5876 A) was calculated as a function of the density ratio (or the electron temperature) for a He plasma, whose loss is dominated by axial diffusion rather than volume recombination, under the condition of the electron density of approximately 10 to the 14th power to 10 to the 15 power / cu cm, the electron temperature of approximately 2.5 to 11 eV, and the ion temperature of approximately 5 to 40 eV. A collisional-radiative model was used in the calculation of the coefficients of the ionization and recombination processes between He I, He II and He III, where the effect of partial trapping of resonance radiations is taken into account. The calculated result is applied to a magnetically confined plasma of a quasi steady MPD (magneto-plasma-dynamic) arcjet. Author

N81-25817# Nagoya Univ. (Japan). Inst. of Plasma Physics.
OVERVIEW OF NEUTRAL BEAM INJECTOR TECHNOLOGY DEVELOPMENTS AT UNIVERSITIES
Akira Miyahara Feb. 1981 26 p refs In JAPANESE Presented at Joint Japan-US Seminar, Tokai, Japan, 12-15 Jan. 1981
(IPPJ-503) Avail: NTIS HC A03/MF A01

Activities of universities on the neutral beam injector developments are overviewed. The subjects consist of NBI construction, components developments and system analyses, which are intensively studied at universities. Although neutral beam injector technologies are present day top topics, however, still a lot of efforts with flexible ideas are necessary to realize reactor relevant neutral beam injector system. Author

N81-25818# Nagoya Univ. (Japan). Inst. of Plasma Physics.
THE OSCILLATION OF THE TRAPPED FLUX IN THE EARLY PHASE OF A REVERSED FIELD THETA-PINCH
Ch. Wu, Y. Aso, S. Himeno, S. Yamaguchi, and K. Hirano Apr. 1981 21 p refs
(IPPJ-516) Avail: NTIS HC A02/MF A01

Magnetic probe measurements show that the flux trapped into the neutral sheet radius R sub o at the early phase of the reversed field theta-pinch does not decrease monotonously but oscillates. A model is proposed which states that the oscillation may be caused by the off-diagonal element of the ion pressure tensor P(i) sub (r theta) which may also drive the plasma rotation. The accuracy of probe measurement was confirmed to be less than 10% by using the excluded flux. The experimental data are compared with the results of one dimensional hybrid code. The agreement between the two is fairly good. M.G.

N81-25819# Nagoya Univ. (Japan). Inst. of Plasma Physics.
AMOUNT OF IMPURITY AND ITS BEHAVIOR IN THE STP-2 SCREW PINCH TOKAMAK
S. Yamaguchi May 1981 36 p refs
(IPPJ-517) Avail: NTIS HC A03/MF A01

Temporal and spatial evolution of oxygen spectral line intensities have been measured in the STP-2 screw pinch Tokamak. The electron density and temperature as measured by Thomson scattering are of the order of 10 to the 14th power/cu cm and 10 eV, respectively. On the basis of these measurements, quasi state state rate equations have been solved to give the OII and OIII ion densities. It is found that the density of oxygen impurity is about several percent of the electron density, and the impurity moves with the bulk plasma. It is confirmed that the impurity originates from the wall of the discharge tube during the initial phase of the discharge. Author

N81-25820# Nagoya Univ. (Japan). Inst. of Plasma Physics.
NUMERICAL SIMULATION ON THE SCREW PINCH BY 2-D MHD PINCH CODE TOPICS INCLUDING IMPURITIES AND NEUTRAL EFFECTS
A. Nagata, H. Ashida (Electrotechnical Lab., Ibaraki, Japan), M. Okamoto, and K. Hirano Mar. 1981 38 p refs
(IPPJ-512) Avail: NTIS HC A03/MF A01

The two dimensional fluid simulation code TOPICS is developed for the STP-2, the shock heated screw pinch at Nagoya. It involves the effects of impurity ions and neutral atoms. In order to estimate the radiation losses, the impurity continuity equations with ionizations and recombinations are solved simultaneously with the plasma fluid equations. The results are compared with the coronal equilibrium model. It is found that the coronal equilibrium model underestimates the radiation losses from shock heated pinch plasmas in its initial dynamic phase. The present calculations including impurities and neutrals show the importance of the radiation losses from the plasma of the STP-2. Introducing the anomalous resistivity caused by the ion acoustic instability, the observed magnetic field penetration is explained fairly well. M.G.

N81-25821# Nagoya Univ. (Japan). Inst. of Plasma Physics.
CURRENT DRIVE BY AN RF WAVE IN A RARE-COLLISION PLASMA 1: FUNDAMENTAL THEORY
Ryo Suhihara, Yukio Midzuno, and Masaji Fukuda Mar. 1981 20 p refs
(IPPJ-511) Avail: NTIS HC A02/MF A01

The distribution function deformed by a monochromatic plasma wave with a finite amplitude in a rare collision plasma is reexamined. A like particle collision operator is used which satisfies the requirement of momentum conservation. A current threshold larger than obtainable from the previous distribution is obtained while the energy loss of the wave is exactly the same in both calculations. The application of this theory to a current drive by a general plasma wave is discussed. M.G.

N81-25822# Nagoya Univ. (Japan). Inst. of Plasma Physics.
MODEL EQUATIONS FOR NONLINEAR TIME EVOLUTION OF THE DISSIPATIVE TRAPPED ION INSTABILITY
A. Hatayama, Y. Koshi, and M. Ogasawara Mar. 1981 12 p refs
(IPPJ-510) Avail: NTIS HC A02/MF A01

A set of model equations of the dissipative trapped ion instability is derived to confirm that modification of the background trapped particle number density may be a possible saturation mechanism. A multiple time scale expansion scheme is applied to the nonlinear fluid equations of Kadomtsev and Pogutse by employing a usual ordering nu sub i < < omega < nu sub e, where nu sub j is the effective collision frequency of the instability. The model equations derived describe the time evolution of the modification of the background trapped particle number density and the amplitude of the dissipative trapped ion mode. M.G.

N81-25823# Nagoya Univ. (Japan). Inst. of Plasma Physics.
OVERVIEW OF SURFACE STUDY OF FUSION RESEARCH IN UNIVERSITIES LINKAGE ORGANIZATION, 2
Akira Miyahara, Kohji Kamada, and Toshiro Yamashina (Hokkaido Univ.) Feb. 1981 48 p refs Presented at Joint Japan - US Seminar, Tokai, Japan, 27-30 Oct. 1980
(IPPJ-501) Avail: NTIS HC A03/MF A01

Surface material developments for fusion devices are overviewed in some detail. Surface properties investigations, surface diagonostics, coating technologies, tritium related surface problems, and permeation studies are included. M.G.

N81-25824# Nagoya Univ. (Japan).
NUMERICAL ANALYSIS FOR ISENTROPIC COMPRESSION OF INITIALLY UNIFORM AND FINALLY NONUNIFORM PD SPHERE
Shigeo Kawata (Tokyo Inst. of Technology), Abe Takashi (Tokyo Inst. of Technology), and Keishiro Niu (Tokyo Inst. of Technology) Mar. 1981 21 p refs
(IPPJ-509) Avail: NTIS HC A02/MF A01

By using the method of characteristics, numerical calculations are carried out to analyze the isentropic compression of a spherical DT pellet whose initial state is uniform and whose final state is nonuniform (available for igniting a burning wave). Through such an isentropic compression, the central part of the pellet can be compressed to a high density and a high temperature. It is shown that a thermonuclear burning wave which is ignited in this part propagates into the other parts of a pellet. Thus a large pellet gain of order 100 can be expected to be realized through this kind of isentropic compression. M.G.

N81-25825# Nagoya Univ. (Japan). Inst. of Plasma Physics.
LONG-PULSE ION SOURCE USING FILAMENTLESS LaB6 MULTI-CATHODES
Yusuke Kubota, Joshin Uramoto, and Akira Miyahara Mar. 1981 17 p refs
(IPPJ-513) Avail: NTIS HC A02/MF A01

A prototype of an ion source for neutral beam injection is described, which is intended to produce a uniform, high current density ion beam over a large area. Two channels of discharge electrode rows are used. To drive this source smoothly, two kinds of power supply systems with three step discharge current controllers are used. Preliminary ion production experiments were carried out successfully in quasi-steady (2 to 7s) mode. The ion current density was as high as 0.25 A/sq cm over an area as wide as 10 cm x 15 cm with the transverse inhomogeneity less than 10% at a discharge current of 230 A per channel. As compared with the ordinary single channel ion source, the discharge current per channel required to obtain same ion current density is so small that the life time of the cathode will be much extended. M.G.

N81-25826# Nagoya Univ. (Japan). Inst. of Plasma Physics.
AN ENERGY BALANCE CONSIDERATION ON THE OHMICALLY IGNITED RFP REACTOR
K. Hirano Mar. 1981 13 p refs
(IPPJ-515) Avail: NTIS HC A02/MF A01

Required conditions for Ohmic ignition of a RFP reactor are estimated using a simple energy balance equation. It is found that for the ignition at the poloidal field of 5T the energy confinement time achieved in a Tokamak must be at least necessary. It is pointed out the heating up of the first wall in the setting up phase is very crucial. In order to save that a larger generator power than 10 GW seems to be required.
Author

N81-25827# JAYCOR, Alexandria, Va.
CORE/CORONA MODELING OF DIODE-IMPLODED ANNULAR LOADS
R. E. Terry and John U. Guillory 7 Nov. 1980 26 p refs
(Contract DNA001-79-C-0189)
(AD-A098450) Avail: NTIS HC A03/MF A01 CSCL 20/9

The effects of a tenuous exterior plasma corona with anomalous resistivity on the compression and heating of a hollow, collisional aluminum z-pinch plasma are predicted by a one-dimensional code. As the interior ('core') plasma is imploded by its axial current, the energy exchange between core and corona determines the current partition. Under the conditions of rapid core heating and compression, the increase in coronal current provides a trade-off between radial acceleration and compression, which reduces the implosion forces and softens the pitch. Combined with a heuristic account of energy and momentum transport in the strongly coupled core plasma and an approximate radiative loss calculation including Al line, recombination and Bremsstrahlung emission, the current model can provide a reasonably accurate description of imploding annular plasma loads that remain azimuthally symmetric. The implications for optimization of generator load coupling are examined. Author (GRA)

N81-25828# Naval Research Lab., Washington, D. C. Plasma Physics Div.
EFFECT OF DIFFERENT INITIAL CONDITIONS ON THE EVOLUTION OF THE E X B GRADIENT DRIFT INSTABILITY IN IONOSPHERIC PLASMA CLOUDS Interim Report
M. J. Keskinen and S. L. Ossakow 14 Apr. 1981 46 p refs
(AD-A098331; NRL-MR-4490) Avail: NTIS HC A03/MF A01 CSCL 20/9

Both small and large amplitude monochromatic (one wave) and random (many waves) initial perturbations have been used to seed initially slablike plasma clouds with different magnetic field line integrated Pedersen conductivity gradient scale lengths L = 4, 6, 10 km perpendicular to the magnetic field. Independent

of the initial conditions used, all of the models studied become similar in the nonlinear late time regime both in real (x, y) space and in Fourier (k sub x, k sub y) space where x and y define the plane perpendicular to the magnetic field. In the nonlinear regime, evidence is presented for an outer scale turnover in the one-dimensional plasma cloud conductivity spatial power spectra computed in a direction (y) perpendicular to the E X B drift (x) of the plasma cloud. In addition, under the different initial conditions used, the spatial power spectra in the nonlinear regime are shown to be anisotropic in the plane perpendicular to the magnetic field with most of the spectral power concentrated along and near the linearly most unstable y-direction. GRA

N81-25829# Naval Research Lab., Washington, D. C. Plasma Physics Div.

ON THE SPATIAL POWER SPECTRUM OF THE E X B GRADIENT DRIFT INSTABILITY IN IONOSPHERIC PLASMA CLOUDS Interim Report

M. J. Keskinen and S. L. Ossakow 14 Apr. 1981 25 p refs
(AD-A098332; NRL-MK-4494) Avail: NTIS HC A02/MF A01 CSCL 20/9

It is shown that the two dimensional power law spatial power spectra of magnetic field line integrated Pedersen conductivity perturbations in the plane perpendicular to the magnetic field recently computed from numerical simulation studies of ionospheric plasma clouds are consistent with conservation laws implied by the fundamental plasma fluid equations describing the E X B gradient drift instability in these ionospheric plasma clouds. Author (GRA)

N81-25830# Naval Research Lab., Washington, D. C.

NUMERICAL SIMULATION OF TOKAMAK ELECTRON DYNAMICS Interim Report

W. H. Miner, N. K. Winsor, and I. B. Bernstein 29 Apr. 1981 36 p refs
(Contract DE-AI01-76ET-53020)
(AD-A098393; NRL-MR-4504) Avail: NTIS HC A03/MF A01 CSCL 20/9

In a Tokamak, the electron distribution deviates from a Maxwellian. This is because the magnetically untrapped electrons moving parallel to the applied electric field tend to run away. Because of the presence of trapped electrons, the distribution also departs from the Chapman-Enskog solution of the weak electric field problem. Previous analytic and numerical methods have treated this distortion in the limit of vanishingly small electric fields, a vanishing small number of trapped electrons, or both. We present a numerical method which relaxes these limitations, and illustrates the distribution functions which result from it. Author (GRA)

N81-25831# Texas Univ., Austin. Inst. for Fusion Studies.

NECESSARY STABILITY CONDITION FOR FIELD-REVERSED THETA PINCHES

J. R. Cary Mar. 1981 18 p refs
(Contract DE-FG05-80ET-53088)
(DOE/ET-53088/10) Avail: NTIS HC A02/MF A01

Toroidal systems of arbitrary cross section without toroidal magnetic field are analyzed via the double adiabatic fluid equations. Such systems are shown to be unstable if there exists one closed field line on which the average of (kappa)(r)(B sq) is positive, where kappa is the curvature. A similar criterion is derived for linear systems and is applied to a noncircular z-pinch. DOE

N81-25832# Stanford Univ., Calif. High Temperature Gasdynamics Lab.

FLUCTUATIONS IN COMBUSTION-DRIVEN MHD GENERATORS

J. P. Barton Aug. 1980 414 p refs
(Contract DE-AC01-80ET-15611)
(DOE/ET-15611/1) Avail: NTIS HC A18/MF A01

Results of an experimental and theoretical investigation of inherent fluctuations that occur within combustion-driven MHD generators are presented. The primary concern was to determine the presence and effects of axially propagating, linear hydrodynamic traveling waves of the magnetoacoustic and magnetoentropic types. The possible development of large fluctuations in high magnetic interaction MHD generators caused by hydrodynamic traveling waves propagating with increasing amplitude was considered. Experimentally, time resolved measurements of pressures, electrode currents, and internal differential voltages within a laboratory scale, combustion driven MHD generator facility were analyzed. Hydrodynamic traveling waves within an MHD duct were theoretically investigated by considering a first order linearization analysis of the controlling, quasi one dimensional fluid and electrical equations of an MHD generator. Comparisons between experimental results and a theoretical model were in qualitative agreement. DOE

N81-25833# Idaho National Engineering Lab., Idaho Falls.

PHYSICS CALCULATIONS FOR PRELIMINARY FEASIBILITY STUDIES OF FUSION BLANKET TESTING IN ETR

D. E. Wessol, J. L. Judd, D. A. Millsap, A. J. Scott, L. G. Miller, G. R. Longhurst, and P. Y. Hsu Mar. 1981 31 p refs
(Contract DE-AC07-76ID-01570)
(EGG-PHYS-5392) Avail: NTIS HC A03/MF A01

Hypothetical irradiations of three fusion first wall/blanket systems in the Engineering Test Reactor are analyzed. The ability to reproduce in a fission environment the bulk heating spatial profiles anticipated in a fusion environment is demonstrated. DOE

N81-25834# Missouri Univ., Rolla. Dept. of Electrical Engineering.

RESEARCH SUPPORT FOR PLASMA DIAGNOSTICS ON ELMO BUMBY TORUS: INVESTIGATION OF DIAMAGNETIC DIAGNOSTICS FOR THE ELECTRON RINGS

Kenneth H. Carpenter Feb. 1981 111 p refs
(Contract W-7405-eng-26)
(ORNL/Sub-7676/1) Avail: NTIS HC A06/MF A01

The diamagnetic flux pickup loops on each cavity put out signals proportional to ring perpendicular energy. A data analysis technique is described which, in its simplest form, is substracting 1/4 the signal from each neighboring cavity pickup loop from the central one's, which provides a signal proportional to the energy in a single ring. The calibration factor relating absolute perpendicular energy to diamagnetic signal depends weakly on the geometrical model for the ring. Calculations with a bumpy cylinder MHD equilibrium code give calibration factors in reasonable agreement (20 percent) to the values obtained using a simple, concentric cylindrical current sheet model. The cylindrical current sheet model is used to show that diamagnetic field components measured external to the plasma require high precision or correlation with other diagnostics in order to fix model parameters. Computerized simulation shows an assumption of constant ring thickness and energy density with increasing length (and energy) is compatible with diamagnetic field observations on NBT. DOE

N81-25835# Science Applications, Inc., Boulder, Colo. Plasma Research Inst.

OMNIGENOUS EQUILIBRIA

P. J. Catto and R. D. Hazeltine (Texas Univ., Austin) Mar. 1981 70 p
(Contract DE-AC03-76ET-53057)
(SAI-254-81-102-LJ; PRI-23) Avail: NTIS HC A04/MF A01

The conditions are obtained for confining a plasma of arbitrary asymmetry, plasma beta, and collisionality, in an equilibrium configuration free of neoclassical transport. Such omnigenous scalar pressure equilibria are shown to exist if and only if the divergence of the parallel current density vanishes, while for an anisotropic pressure other mill restrictions are needed. Explicit constraints are derived for axisymmetric torii and long thin, low beta conventional and tandem mirrors. DOE

N81-25836# Pennsylvania Univ., Philadelphia. Dept. of Mechanical Engineering and Applied Mechanics.

WALL EMISSION DOMINATED DISCHARGE CHANNEL

Ira M. Cohen May 1980 24 p refs
(Grant NSF ENG-76-25899)
(PB81-146805; MEAM-80-1; NSF/RA-800343) Avail: NTIS HC A02/MF A01 CSCL 20I

Diffusion of ions and electrons through a uniform neutral gas was studied under complete wall emission absorption boundary conditions to understand more clearly the role of emitting and absorbing electrodes in MHD type channel flows. All other

effects were ignored to obtain a closed from exact solution for charged and seed neutral particle densities and a self consistent electric field. From these solutions, current voltage characteristics of the discharge form of ordinary ionization chamber characteristics. For small Debye length, cathode and anode profiles indicating that the densities were in equilibrium with the self consistent electric field. GRA

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

N81-25837 California Inst. of Tech., Pasadena.
THEORETICAL STUDIES OF THE NONLINEAR INFRARED PROPERTIES OF p-TYPE SEMICONDUCTORS Ph.D. Thesis
Ralph Boyd James 1981 221 p
Avail: Univ. Microfilms Order No. 8109054

The intensity dependence of the complex dielectric constant of p-type germanium for light with a wavelength in the 9 to 11 mcm region was studied. The nonlinear absorption by the imaginary part of the complex dielectric constant, and the nonlinear dispersive properties by the intensity dependence of the real part of the dielectric constant. The free hole distribution function is modified by the high intensity light, which leads to an intensity dependence in the absorption coefficient and the index of refraction. Saturation behavior of most p-type semiconductors with the diamond or zincblende crystal structure are described. In each material, the saturation intensity values are a function of the photon energy and temperature. Increasing transmission of the probe laser is caused by the depletion of holes in the heavy hole band by the saturating beam. Absorption coefficient values are calculated by the intensity of the pump laser. The probe absorption is caused by depletion of holes in the resonant region by saturable pump, and coupling of the pump and probe beams which allow the pump photons to be scattered into the probe. Modification of the free hole distribution function by the saturating beam leads to a change in the conductivity of p-Ge. Photoconductive response is calculated as a function of the doping level, temperature, and light intensity. Dissert. Abstr.

N81-25838 California Inst. of Tech., Pasadena.
THE DEVELOPMENT OF NOVEL NUCLEAR MAGNETIC RESONANCE TECHNIQUES FOR THE STUDY OF SOLIDS, THIN FILMS AND SURFACES WITH PARTICULAR APPLICATION TO AMORPHOUS SEMICONDUCTING SILICON-HYDROGEN FILMS Ph.D. Thesis
Jeffrey Allen Reimer 1981 168 p
Avail: Univ. Microfilms Order No. 8107276

Proton magnetic resonance data are presented for twenty different plasma-deposited amorphous silicon-hydrogen films. The two phase compositional inhomogeneity observed in these films is found to be independent of film thickness down to less than 1micron. Models for various structural configurations show that these films contain heavily monohydride clustered regions such as divacancies and voids, as well as (SiH2) sub n and SiH3 local bonding configurations. Silicon-29 and hydrogen magic angle sample spinning experiments on amorphous silicon-hydrogen films (involving cross-polarization and homonuclear multiple pulse techniques respectively) fail to yield quantitative determinations of local silicon-hydrogen bonding environments. Protpn magnetic resonance data are presented for the hydrogen alloys of plasma-deposited amorphous boron, carbon, silicon carbide and silicon nitride. Dissert. Abstr.

N81-25839 Stanford Univ., Calif.
AN ULTRAVIOLET PHOTOEMISSION STUDY OF SILICON SURFACE STATES Ph.D. Thesis
Lawrence F. Wagner, Jr. 1981 413 p
Avail: Univ. Microfilms Order No. 8109011

The cleaved (111) surface of silicon was observed and studied. A band of surface states about 1.8 eV wide and peaked about 0.6 eV below valence band maximum was found and observed to be highly sensitive to surface contamination or oxygen exposure. The application of cesium to the surface demonstrates that the surface states were removed with a metallic overlayer in much the same way as with oxygen. A intermediate state was encountered during the cesiation of the lightly doped silicon which had an unusually low work function. For this case, weak emission from regions near the X final state minima was observed. This emission must necessarily be weak, since the final state electrons must exchange momenta with phonons prior to escaping into the vacuum. The low work function permitted the observation of the L- + or - minimum to be 1.7 0.1 eV V above the valence band maximum. Other conduction band structures were also observed and located. Result of experiments done on the copper reference shutter are also reported. Dissert. Abstr.

N81-25840 Stanford Univ., Calif.
ELECTRONIC STRUCTURE OF TRANSITION-METALS AND TRANSITION-METAL COMPOUNDS Ph.D. Thesis
Sverre Froyen 1981 95 p
Avail: Univ. Microfilms Order No. 8108927

It is noted that for solids in the diamond structure there is a close resemblance between the true bands, the nearest-neighbor linear combination of atomic orbitals (LCAO) bands, and the free-electron bands. Making use of the similarity of the last two, universal LCAO parameter for the interatomic matrix elements between s- and p-like states. Next the assumption of a muffin-tin zero equal to the d-state energy, is used in transition-metal pseudopotential theory to derive a simple from a hybridization matrix element given for all 27 transition elements. A elementary method is given for determining the intra-atomic matrix elements E sub d for transition metals and their compounds. A general expression for the electronic susceptibility is derived and used to calculate numerical values for some perovskites and the alkali-halides. Finally the effect of the Cu d-states on the elastic shear constant of CuCl and some limitations in the universal parameters are investigated. Dissert. Abstr.

N81-25841 California Univ., Riverside.
AN INVESTIGATION OF THE HALL EFFECT IN IMPURITY HOPPING CONDUCTION Ph.D. Thesis
Robert Samuel Klein 1980 128 p
Avail: Univ. Microfilms Order No. 8110273

Holstein's theory had to be extended to lower temperature (T) and higher magnetic field (H), to determine the most promising conditions for finding the Hall effect. Transmutation doped p type germanium was used which had an acceptor (gallium) concentration, N sub A = 1.04 x 10 to the 15th power per cu cm and compensation ratio of K = 0.4. The doping mechanism assured random impurity distribution. Dissert. Abstr.

N81-25842# Georgia Inst. of Tech., Atlanta. School of Physics.
CORRELATION AND COLLECTIVE MODES IN NARROW BAND MATERIALS: NIO AND FeO Interim Report, 1 Oct. 1979 - 30 Sep. 1980
Martin W. Ribarsky 1 Feb. 1981 30 p refs
(Grant AF-AFOSR-0023-80)
(AD-A096999; AFOSR-81-0280TR) Avail: NTIS HC A03/MF A01 CSCL 07/2

A model was development that is studying the plasma structure in the presence of a strong lattice potential and the response of electrons in the material to an optical or electronic probe. The experimental electronic loss structures for bulk and oxidized transition metals is analyzed in terms of this model. The effects on superconductivity of the dynamical response of electrons and especially coupling via plasmons or excitons was studied for Cu2O. It is shown that there may be a connection between experiments on copper oxides which shows nearly complete shielding of electric fields and experiments which show excitons in the oxide may obey Bose-Einstein statistics. More careful calculations for this and other transition metal oxides are discussed. T.M.

N81-25843# Catholic Univ. of America, Washington, D.C. Dept. of Physics.
PHASE DIAGRAMS OF A SIMPLE H-BONDED LATTICE GAS OBTAINED WITH THE CLUSTER VARIATION METHOD

Eddy vanRoyen and Paul H. E. Meijer Jan. 1981 47 p refs
(Contract N00014-78-C-0518)
(AD-A094158; TR-4) Avail: NTIS HC A03/MF A01 CSCL 20/13

The Bell lattice model for water, which explores the parameter space with the cluster variation method of Kihuchi, was evaluated. Ten order parameters are used to describe the different occupations of tetrahedrons in the lattice, with and without hydrogen bonds. The phase diagrams are represented in the density temperature plane and in the pressure temperature plane. First order terminal points in the metastable region are explained. The 180 deg rule and the ratios of hydrogen bonded pairs versus nonhydrogen bonded pairs are also discussed. E.A.K.

N81-25844# Minnesota Univ., Minneapolis. School of Physics.
EXPERIMENTAL STUDIES IN SOLID STATE AND LOW TEMPERATURE PHYSICS ***Final Report***
A. M. Goldman and W. V. Weyhmann Feb. 1981 16 p refs
(Contract N00014-76-C-1086)
(AD-A098728) Avail: NTIS HC A02/MF A01 CSCL 20/12

Experimental and theoretical investigations have been carried out in a broad area of low temperature and solid state physics which includes superconductivity and magnetism in metals. The work in superconductivity has involved investigations of the Josephson effect, studies of the pair-field susceptibility of superconductors and investigations of the thermodynamics of the superconducting phase transition. The competition between the metal-nonmetal transition and superconductivity has also been studied in random metal-rare gas systems. In the area of magnetism, magnetically ordered materials and dilute magnetic alloys have been investigated. Enhanced hyperfine nuclear magnetic ordering was discovered in PrCu(6) at about 2.5 mK. The ONR contributed to the support of this work by supplying helium gas which was used to make up losses in the helium recovery operation associated with the use of liquid helium by the workers named in the proposal. Author (GRA)

N81-25845# Air Force Weapons Lab., Kirtland AFB, N. Mex.
THE EFFECTS OF OXYGEN PRESSURE ON TOTAL DOSE SUSCEPTIBILITY **Final Report**
Roe J. Maier, Jr. Jan. 1981 33 p refs
(AD-A098654; AD-E200695; AFWL-TR-80-106) Avail: NTIS HC A03/MF A01 CSCL 20/12

It has been hypothesized that the fixed charge induced by ionizing radiation in the oxide of metal-oxide-silicon (MOS) structures is the result of traps produced by excess silicon. If this is so, then the amount of charging should vary with the oxygen pressure at which the oxide was grown. In this experiment, samples grown at partial pressures of 0.03, 0.04, 0.25, and 1 x 10 to the fifth power Pa (atm) and samples grown at 16, 33, 65, 129, 263 and 513 x 10 to the fifth power Pa (atm) were exposed to 1 Mrad(Si) Co to the sixtieth power. The radiation-induced shifts in voltage, at which the surface potential is at flat band and midgap, were recorded for an annealing period of 63 days or longer. The results from the partial pressure oxides data supported the hypothesis. GRA

N81-25846# *Army Electronics Technology and Devices Lab., Fort Monmouth, N. J.*
ANALYSIS OF ELECTRICALLY ACTIVE IMPURITY LEVELS ***IN IN-SITU COMPOUNDED SEMI-INSULATING GALLIUM ARSENIDE***
H. A. Leupold, J. J. Winter, R. L. Ross, and T. R. AuCoin Mar. 1981 36 p refs
(DA Proj. 1L1-61102-AH-47)
(AD-A098532; DELET-TR-81-7) Avail: NTIS HC A03/MF A01 CSCL 20/12

Conductivity and Hall measurements were made on semi-insulating GaAs samples grown with a recently developed process using in-situ compounding with liquid encapsulated (B2O3) Czochralski growth techniques. Mixed conduction analysis in combination with a nomographic analysis of charge balance and conduction was used to elucidate compensation in this material. Given the Cr concentration in one sample, the use of an iterative self-consistent procedure allowed the deduction of total donor and acceptor concentrations for identically prepared Cr-doped and undoped samples. Further analysis yielded the compensation ratio and energy level of the dominant acceptor of a third specimen. A subsequent spark source analysis confirmed the high purity of this in-situ compounded material, as well as the conclusions and utility of the nomographic analysis. Author (GRA)

N81-25847# Army Electronics Technology and Devices Lab., *Fort Monmouth, N. J.*
SCANNING PHOTOVOLTAGE INVESTIGATION OF SILICON- AND GALLIUM ARSENIDE-BASED METAL OXIDE SEMICONDUCTOR (MOS) CAPACITORS
R. L. Streever and J. J. Winter Mar. 1981 14 p refs
(DA Proj. 1L1-61102-AH-47)
(AD-A098394; DELET-TR-81-9) Avail: NTIS HC A02/MF A01 CSCL 09/3

The scanning photovoltage technique was used to image the semiconductor-oxide interface region of MOS capacitors based on silicon and on GaAs. The technique gives a 'photovoltage image' of optically active defects at the interface. Various types of defects and gross imperfections were observed. In the case of the GaAs MOS capacitors, a high density of gross imperfections resulting from surface damage was observed on lightly etched samples. Heavier etching was noted to eliminate this damage and the lower defect density can be correlated with improved device performance. Author (GRA)

N81-25848# Texas Instruments, Inc., Dallas. Central Research Labs.
GaAs FET LOGIC AT LOW TEMPERATURES **Annual Technical Report, 1 Sep. 1979 - 31 Aug. 1980**
M. R. Namordi and F. H. Doerbeck Oct. 1980 54 p
(Contract N00014-79-C-0789; RF62582001)
(AD-A098390; TI-CRL-0789; TI-CRL-08-80-33) Avail: NTIS HC A04/MF A01 CSCL 20/12

Efforts during the first year of this contract have concentrated on process development, material development and characterization and circuit development. Preliminary results on single stage inverters show about a two-fold speed advantage at 77 K compared to that at 300 K for material doped in the mid-ten to the 16th per cu cm range. This advantage is offset by an aprox. 90% increase in power dissipation at 77 K compared to that at 300 K, so the speed-power product is approximately the same at the two temperatures. A more accurate assessment of circuit speed and power dissipation is expected by the use of ring oscillators. Accordingly, work has been concentrated in this area during the latter part of this period. GRA

N81-25849# Washington Univ., St. Louis, Mo. Dept. of Electrical Engineering.
SYSTEM FOR THE TRANSPORT ANALYSIS OF SEMICONDUCTOR MATERIALS
S. L. Vonrump, F. J. Rosenbaum, R. E. Goldwasser, M. H. Homsey, and M. H. Riess Oct. 1980 166 p refs
(Contract N00014-79-C-0084O; RR0210203)
(AD-A098519; Rept-80-2-ONR) Avail: NTIS HC A08/MF A01 CSCL 20/12

The conception, design, and realization of a system for the transport analysis of semiconductor materials is presented. A survey of the relevant literature on transport measurements is made to determine existing problems and potential contributions to the theory an to experimental methods. Theoretical contributions include a solution to the velocity-field curve for the case of arbitrary doping profile and the resulting nonuniform electric field distribution, and a treatment of diffusion effects. Improvements to the microwave time-of-flight method employed here are also presented, and an evaluation of the present system is provided. Author (GRA)

N81-25850# Princeton Univ., N. J. Dept. of Electrical Engineering and Computer Science.
MICROSCOPIC PROCESSES AT THE GAS-SOLID INTERFACE OF COMPOUND SEMICONDUCTORS **Final Technical Report, 1 Jan. 1975 - 31 Dec. 1980**
Peter Mark and Antoine Kahn Mar. 1981 12 p refs
(Contract N00014-75-C-0394; NR Proj. 372-055)
(AD-A098395) Avail: NTIS HC A02/MF A01 CSCL 20/12

The original goal of this research was the study of microscopic processes at the surface of compound semiconductors. This effort developed in three major directions. Firstly, the atomic geometry

of a number of III-V and II-VI compound surfaces has been studied via Low Energy Electron Diffraction (LEED) and Auger Electron Spectroscopy (AES). Although this study is still in process, a trend in surface reconstruction versus crystal bonding ionicity is likely to emerge. Secondly, we have studied the structural effects of the gas-semiconductor (in particular oxygen-GaAs (110) interaction and have concluded to the formation of a thin amorphous layer (probably oxide) covering an ideally terminated periodic lattice. Finally, we have thoroughly studied the formation and structure of a thin metal (Al) overlayer on a semiconductor compound (GaAs(110)) and present a detailed analysis of the structure of a growing AlAs compound at the interface. GRA

N81-25851# Princeton Univ., N. J.
A SCALING THEORY OF THE HALL EFFECT IN DISORDERED ELECTRONIC SYSTEMS
Boris Shapiro and Elihu Abrahams Apr. 1981 16 p refs
Prepared in cooperation with Rutgers The State Univ.
(Contract N00014-77-C-0711; Grant NSF DMR-79-21360)
(AD-A098460) Avail: NTIS HC A02/MF A01 CSCL 07/4

A scaling theory for the Hall effect in disordered electronic systems is developed. It is suggested that a universal scaling function for the Hall conductance exists, and the leading quantum correction to the classical value (d-2) of this function is calculated (d is the dimensionality). It is shown, by means of a scaling argument, that at the mobility edge the zero temperature Hall conductivity approached zero with an exponent t sub h = 2t, where t is the conductivity exponent. This relation between the exponents is supported by a microscopic calculation in 2 - epsilon dimensions, which yields t = 1, t sub h = 2. GRA

N81-25852# Princeton Univ., N. J. Joseph Henry Labs. of Physics.
FURTHER REMARKS ON METASTABILITY IN AMORPHOUS SEMICONDUCTORS
D. C. Licciardello Apr. 1981 12 p refs Prepared in cooperation with Bell Telephone Labs., Inc., Murray Hill, N.J.
(Contract N00014-77-C-0711; Grant NSF DMR-80-2063)
(AD-A098461) Avail: NTIS HC A02/MF A01 CSCL 20/12

The bandwidths for metastable states in a simple model of amorphous semiconductors is evaluated exactly. The region of metastability in the space of the model parameters (phase diagram) is deduced and the subregion corresponding to an infinite range model is indicated. The model predicts both paramagnetic and diamagnetic metastable states and the relationship between them is discussed. Author (GRA)

N81-25853# Motorola, Inc., Scottsdale, Ariz.
DOUBLY ROTATED CUT SAW DEVICES Interim Report, 1 Mar. - 1 Sep. 1980
D. F. Williams and F. Y. Cho Apr. 1981 71 p refs
(Contract DAAK20-79-C-0275)
(AD-A098545; DELET-TR-79-0275-2; IR-2) Avail: NTIS HC A04/MF A01 CSCL 20/2

The exploratory development of doubly rotated cuts of quartz possessing superior surface acoustic wave (SAW) properties for applications involving environmentally hardened devices is described. The key properties examined and optimized both theoretically and experimentally are: first, second and third order temperature coefficients of delay (TCD), piezoelectric coupling factor, power flow angle, bulk acoustic wave (BAW) inverse velocity surfaces, degeneracies and leaky waves, and sensitivities of the above quantities to misorientations and manufacturing tolerances. An interactive numerical/experimental approach is used. GRA

N81-25854# Purdue Univ., Lafayette, Ind.
STUDY OF THE MOTION OF ELECTRONS IN NON POLAR CLASSICAL LIQUIDS. MEASUREMENT OF HALL EFFECT AND f.i.r. SEARCH FOR LOW ENERGY TRAPS Progress Report
10 Mar. 1981 12 p refs
(Contract DE-AS02-79ER-10375)
(DOE/ER-10375/T1) Avail: NTIS HC A02/MF A01

Progress is reported on experiments aimed at the measurement of the Hall mobility of injected electrons in classical nonpolar insulating liquids and the optical absorption associated with electrons captured by shallow traps in the liquefied rare gases. Theoretical work aimed at a better understanding of the trapping kinetics of electrons by SF6 and O2 dissolved in rare gas liquids was also carried out. Its conclusion is that the electric field dependence of the trapping probability can be explained, basically without adjustable parameters, by considering the Poole-Frenkel-Schotky ionization of the excited state of the traps. From the analysis of published data on the motion of electrons in liquid ethane it is tentatively concluded that at low temperature the trapping of electrons in the liquid involves a Jahn-Teller like distortion of a single ethane molecule while at higher temperatures it is necessary to consider a small molecular cluster, possibly made up of two molecules. DOE

N81-25855# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
COINCIDENCE LATTICE MODEL FOR THE STRUCTURE AND ENERGY OF GRAIN BOUNDARIES
A. Brokman and R. W. Balluffi Jan. 1981 54 p refs
(Contract DE-AS02-78ER-05002-16)
(DOE/ER-05002/16) Avail: NTIS HC A04/MF A01

It is proposed that, to a good approximation, the construction of a boundary can be described in terms of three basic steps: (1) a rigid body joining of two perfect crystals along the boundary plane; (2) a primary relaxation consisting of relaxations in the boundary centered on O lattice elements which act to improve lattice matching in these regions; and (3) a possible secondary relaxation which produces the final structure composed of patches of a low sigma boundary and secondary grain boundary dislocations. The energy after step 1 is obtained by summing pairwise interactions across the boundary and is found to be relatively low for a number of low sigma boundaries and to approach a larger constant value for all large sigma boundaries. The energy decrease due to step 2 varies monotonically with crystal misorientation according to a Read-Shockley function, and the energy decrease associated with step 3 produces cusps in the energy versus misorientation curve at misorientations corresponding to low sigma boundaries. DOE

N81-25856# Connecticut Univ., Storrs.
ELECTRON-DISLOCATION INTERACTIONS AT LOW TEMPERATURES Progress Report
1981 10 p refs
(Contract DE-AS02-76ER-02305)
(DOE/ER-02305/T1) Avail: NTIS HC A02/MF A01

Magneto-oscillations were observed in the dislocation drag process. A rotational peak was observed which is related to the rotation of a magnetic field relative to the slip plane of deforming crystals. Twinning of a zinc crystal was shown to be related to the velocity of the dislocations involved. DOE

N81-25857 Kent State Univ., Ohio.
MEASUREMENTS OF CURVATURE ELASTICITY AND VISCOSITY COEFFICIENTS OF AN AMPHIPHILIC NEMATIC LIQUID CRYSTAL Ph.D. Thesis
Thomas Jay Haven 1980 86 p
Avail: Univ. Microfilms Order No. 8108311

Physical, elastic, and flow properties of amphiphilic nematic liquid cristalline were measured. Refractive indexes were measured for temperature and water concentration on surface aligned films. The transition from the lamellar smectic phase to the nematic phase is continuous since there are no abrupt changes in the refractive indices through the transition. Elasticity coefficients were measured by deforming surface aligned films by a magnetic field. Date were evaluated to obtain the elasticity coefficients by an iterative computer program based on the Frank-Oseen equations. An effective rotational viscosity coefficient was calculated by the Leslie-Ericksen theory. Relative values of elasticity and visociety coefficients were determined for two different mixtures. It was found that the magnitudes are the same for both samples. Dissert. Abstr.

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also 25 Inorganic and Physical Chemistry and 34 Fluid Mechanics and Heat Transfer.

N81-25858 Wisconsin Univ. - Madison.
PROPAGATORS AND RENORMALIZATION OF QUANTUM FIELD THEORY IN CURVED SPACETIMES Ph.D. Thesis
Prakash Panangaden 1980 198 p
Avail: Univ. Microfilms Order No. 8110641

Perturbation theory was formulated for a self-interacting scalar field and for quantum electrodynamics. It is shown that the effects of interaction and the effect of the curvature can be separated and a diagrammatic interpretation can be given to the terms of the perturbation expansion. The divergences occurring in the low order diagrams in both theories may be removed by an (infinite) rescaling of fields, masses and coupling constants. It is shown that a choice of Feynman propagator implicitly defines the particle states in the past and in the future. Futhermore explicit expressions are obtained for these states and also for an operator that describes the particle creation amplitudes. The question of stimulated emission from black holes is addressed.
Dissert. Abstr.

N81-25859# California Univ., Berkeley. Lawrence Berkeley Lab. Earth Sciences Div.
THERMODYNAMICS OF GEOTHERMAL FLUIDS Ph.D. Thesis
P. S. Z. Rogers Mar. 1981 253 p *refs*
(Contract W-7405-eng-48)
(LBL-12356) Avail: NTIS HC A12/MF A01

A model to predict the thermodynamic properties of geothermal brines, based on a minimum amount of experimental data on a few key systems, is tested. Volumetric properties of aqueous sodium chloride, taken from the literature, are represented by a parametric equation over the range 0 to 3000 C and 1 bar to 1 kbar. Density measurements at 20 bar needed to complete the volumetric description also are presented. The pressure dependence of activity and thermal properties, derived from the volumetric equation, can be used to complete an equation of state for sodium chloride solutions. A flow calorimetere, used to obtain heat capacity data at high temperatures and pressures, is described. Heat capacity measurements, from 30 to 2000 C and 1 bar to 200 bar, are used to derive values for the activity coefficient and other thermodynamic properties of sodium sulfate solutions as a function of temperature. Literature data on the solubility of gypsum in mixed electrolyte solutions are used to evaluate model parameters for calculating gypsum solubility in seawater and natural brines. Predictions of strontium and barium sulfate solubility in seawater also are given. *DOE*

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N81-25860*# National Aeronautics and Space Administration, Washington, D. C. Office of Equal Opportunity Programs.
WOMEN AT WORK IN NASA
Harriett G. Jenkins 1980 20 p
(NASA-TM-52358) Avail: NTIS HC A02/MF A01 CSCL 05A

Photographs and brief descriptions summarize the diversity of the female work force at NASA. Jobs are classified as: (1) technical support positions; (2) clerical and nonprofessional administrative; (3) professional administrative; and (4) professional scientific and engineering. S.F.

N81-25861*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PROJECT RESOURCE REALLOCATION ALGORITHM
J. E. Myers May 1981 52 p
(NASA-TM-82419) Avail: NTIS HC A04/MF A01 CSCL 05A

A methodology for adjusting baseline cost estimates according to project schedule changes is described. An algorithm which performs a linear expansion or contraction of the baseline project resource distribution in proportion to the project schedule expansion or contraction is presented. Input to the algorithm consists of the deck of cards (PACE input data) prepared for the baseline project schedule as well as a specification of the nature of the baseline schedule change. Output of the algorithm is a new deck of cards with all work breakdown structure block and element of cost estimates redistributed for the new project schedule. This new deck can be processed through PACE to produce a detailed cost estimate for the new schedule. J.D.H.

N81-25862*# *National Aeronautics and Space Administration.* Langley Research Center, Hampton, Va.
GUIDELINES FOR COST CONTROL AND ANALYSIS OF *COST-TYPE RESEARCH AND DEVELOPMENT CONTRACTS*
Charles W. Sibbers May 1981 71 p
(NASA-TM-83108) Avail: NTIS HC A04/MF A01 CSCL 05A

The cost information which should be obtained from a contractor(s) on a major, cost type research and development contract(s), and the analyses and effective use of these data are discussed. Specific type(s) of information which should be required, methods for analyzing such information, and methods for effectively using the results of such analyses to enhance NASA contract and project management are included. The material presented is based primarily on the principal methods which have been effectively used in the management of major cost type research and development contracts. J.M.S.

N81-25863# Computer Systems Management, Inc., Arlington, Va.
DEFENSE MICROCOMPUTING IN THE 1980S: PROBLEMS AND RESEARCH PRIORITIES Quarterly Technical Report, 1 Oct. 31 Dec. 1980
James F. Wittmeyer, III 31 Dec. 1980 54 p refs
(Contract MDA903-80-C-0155; ARPA Order 3829)
(AD-A094076; CSM-81-01; TR-81-01) Avail: NTIS HC A04/MF A01 CSCL 12/1

The addition of the production rate variable to the standard learning curve model was studied and validated as a technique in estimating direct labor hours for airframes, avionics equipment, and aircraft engines. To determine if the technique was applicable to air launched missiles, the Maverick and Short Range Attack Missile (SRAM) production programs were evaluated. Addition of the production rate variable contributed to model estimating capabilities. Auto correlation of residuals was reduced in almost every case, enhancing the models' appropriateness for the data studied. The model is useful in many missile production programs, but the specific program must be individually evaluated prior to model application. Model improvements were also implemented to reduce computer run time, increase model flexibility, and provide residual analysis statistics. S.F.

N81-25864# California Univ., Livermore. Lawrence Livermore Lab.
REVIEW OF METHODS FOR EVALUATING R AND D
K. G. Feller 14 Nov. 1980 27 p refs
(Contract W-7405-eng-48)
(UCID-18890) Avail: NTIS HC A03/MF A01

Methods are reviewed of research and development (R and

D) evaluation from the literature (in the industrial R and D setting and those proposed specifically for Federal R and D programs) relative to the types of R and D evaluation problems faced by DOE's Office of Advanced Conservation Technologies. Recommendations are made on the types of analysis which are more likely to make a useful contribution to the R and D management process. Speficic methods are briefly summarized. The portfolio problem, i.e., the problem of allocating resources over several program elements which support related technologies, is examined. DOE

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N81-25865# RAND Corp., Santa Monica, Calif.

AI FOR SYSTEMS MANAGEMENT

Frederick Hayes-Roth Jan. 1981 35 p refs
(RAND/P-6573) Avail: NTIS HC A03/MF A01

Complex systems require intelligent control strategies, and artifical intelligence (AI) concepts and tools contribute to the management of such systems. Several AI approaches to systems management problem are studied, including: 1 a model of the system to be managed; 2 a situation assessement function that employs the model to interpret sensor data; and 3 a planning and control function that employs the model to select desired actions. This broad approach generalizes many of the recent advanced AI applications and defines a substantial research and development program. Improving the technologies for modeling and simulation is discussed, as well as systematizing and improving situation assessment methods, and expanding a repertoire of planning strategies and tools. S.F.

N81-25866*# Mitre Corp., McLean, Va. Metrek Div.

SURVEY OF FEDERAL, NATIONAL, AND INTERNATIONAL STANDARDS APPLICABLE TO THE NASA APPLICATIONS DATA SERVICES

T. Kuch and R. Sakamoto Mar. 1981 220 p refs
(Contract NAS5-25171)
(NASA-CR-166675; MTR-81W5) Avail: NTIS HC A10/MF A01 CSCL 05B

An applications data service (ADS) was developed to meet the challenges in the data access and integration. The ADS provides a common service to locate and access applications data electronically and integrate the cross correlative data sets required by multiple users. Its catalog and network services increase data visibility as well as provide the data in a more rapid manner and a usable form. R.C.T.

N81-25867# Defense Technical Information Center, Alexandria, Va.

SOURCE HIERARCHY LIST. VOLUME 1: A - H Progress Report, period ending Dec. 1980

James J. McCadden, comp. and Barbara P. Gladd, comp. Feb. 1981 674 p Supersedes DTIC/TR-80/2-Vol-1 2 Vol.
(AD-A098600; DTIC/TR-81/4-Vol-1; DTIC/TR-80/2-Vol-1)
Avail: NTIS HC A99/MF A01 CSCL 05/2

This is the first of two volumes of an alphabetical listing of corporate authors as used for announcement of reports received in the Defense Technical Information Center (DTIC). Former names of organizations are included and displayed below the current source name used by DTIC. Cross references direct the user from sub-element organizations to the major source level entry where they are also displayed. Major and sub-hierarchies are preceded and ended by a row of asterisks. This list is used in conjunction with and is not a replacement for DTIC's Source Header Leader List Volume 1, AD-A094000 and Volume 2, AD-A094001. It displays only those source names from the Source Header List for which Hierarchical linkages are pertinent. Author (GRA)

N81-25868# Defense Technical Information Center, Alexandria, Va.

SOURCE HIERARCHY LIST. VOLUME 2: I - Z Progress Report, period ending Dec. 1980

James J. McCadden, comp. and Barbara P. Gladd, comp. Feb. 1981 686 p 2 Vol.
(AD-A098601; DTIC/TR-81/4-Vol-2; DTIC/TR-80/2-Vol-2)
Avail: NTIS HC A99/MF A01 CSCL 05/2

An alphabetical arrangement is presented for hierarchical linkages established for computer retrieval of data cataloged under source names. Hierarchical relationships are coded to a maximum of six levels within each set of source names. Format names of organizations are included in this list and displayed below the current source. Indentations and dots identify relative hierarchical levels. One dot preceding a source name indicates that it is displayed one level under the major source name; two dots indicate display two levels under the major source name; etc. Cross references are displayed from each hierarchy subset to inform the user that the subset is linked to a major level source name and displayed under the alphabetical placement of that major source name. Each hierarchy is preceded and ended by a row of asterisks. Page headings indicate either the first major source appearing on a page, or the main hierarchy to which the first source is linked. Source code numbers currently used in DTIC appear to the right of the source names. The volume contains listing AD-A09400. R.C.T.

N81-25869# Ohio State Univ., Columbus. Computer and Information Science Research Center.

A SURVEY OF CONCURRENCY CONTROL MECHANISMS FOR CENTRALIZED AND DISTRIBUTED DATABASES

David K. Hsiao and Tamer M. Ozsu Feb. 1981 86 p refs
(Contract N00014-75-C-0573)
(AD-A098348; OSU-CISRC-TR-81-1) Avail: NTIS HC A05/MF A01 CSCL 09/2

One of the most important problems in the design of centralized and distributed database management systems is the problem of concurrency control. Even though many different solutions have been proposed, a unifying theory is still not in sight. This report attempts to survey all the published proposals on concurrency control. In particular, a taxonomy is developed for the classification of concurrency control techniques for distributed database systems. The survey of these twenty some concurrency control mechanisms are in the framework of this taxonomy. GRA

N81-25870# Michigan State Univ., East Lansing. Dept. of Physics.

UPDATING SCIENTIFIC INFORMATION THROUGH KEY PUBLICATIONS Progress Report

Peter Signell 9 Apr. 1981 9 p
(Contract DE-AC02-79ER-10516)
(DOE/ER-10516/T8) Avail: NTIS HC A02/MF A01

A method is shown to quickly update scientific information in a particular area, using a key publication from that area. The method presented, using a key publication, avoids the usual frustrating search for all possible key words that might have been usd by the persons who stored the data. DOE

N81-25871# Washington State Dept. of Natural Resources, Olympia. Div. of Management Services.

DEVELOPMENT OF A STATEWIDE GEOGRAPHIC INFORMATION SYSTEM IN WASHINGTON Final Report, 1 Jan. 1979 - 30 Mar. 1980

Tim W. D. Gregg, Larry J. Sugarbaker, Eric W. Barthmeier, Robert B. Scott, and Roger A. Harding Mar. 1980 143 p
(Contract PNRC-10990018)
(PB81-148611; DNR-918-03) Avail: NTIS HC A07/MF A01 CSCL 05B

The State of Washington Department of Natural Resources developed a cooperative statewide geographic information system which combines a statewide mapping, geographic information storage and remote sensing data collection/processing activities. The development of this system is in response to state legislation and the need for more compatible data at county, state and federal levels. GRA

N81-25872# North Carolina Univ. at Chapel Hill.
SCIENCE AND TECHNOLOGY FOR DEVELOPMENT: CORPORATE AND GOVERNMENT POLICIES AND PRACTICES
Jack N. Behrman and William A. Fischer Cambridge, Mass. Oelgeschlager, Gunn & Hain, Publishers, Inc. 1980 158 p ref Sponsored in cooperation with Fund for Multinational Management Education, New York
(Grant NSF PRA-77-21851)
(PB81-146789; ISBN-0-89946-023-2; NSF/PRA-7721851/1; LC-79-27213) Avail: NTIS HC A08/MF A01 CSCL 05B

A series of case studies concerning research and development (R & D) activities of five transnational corporations (TNCs), initiated in 1977, was extended. In a phase involving 58 international companies operating in the United States, Europe, and Japan, the limits of inquiry were broadened. A better understanding of the relationship of science and technology (S & T) policies of developing countries to the R & D of international companies was sought. Nine less developed countries (LDCs) were included to determine ways other countries might help them develop indigenous capabilities. Three of the original studies are included, as well as findings of more recent investigations in the following areas: pharmaceutical programs in tropical diseases; S & T policies of developing countries; and United States response to S & T needs in industrial development of LDCs. GRA

83 ECONOMICS AND COST ANALYSIS

- Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N81-25873# Committee on Appropriations (U. S. House).
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT, INDEPENDENT AGENCIES APPROPRIATIONS FOR 1982, PART 7
Washington GPO 1981 1216 p Hearings before Subcomm. of the Comm. on Appropriations, 97th Congr., 1st Sess., 6 May 1981
(GPO-79-791) Avail: Committee on Appropriations

The impact of the President's revised budget on NASA program management, research and development, and construction of facilities is examined. The reconstitution of the International Polar Mission using two European spacecraft, integration of the Centaur into the shuttle to meet the 1985 Galileo project launch, and the termination of various agency capabilities are considered. Although the budget contains no new flight starts or initiatives for fiscal year 1982, it does represent a balanced program in space sciences, applications, aeronautics, and space technology, and supports the final development phase of the space shuttle, production of the orbiter fleet, and development of upper stage capability for planned planetary and other high energy missions. A.R.H.

N81-25874# Committee on Commerce, Science, and Transportation (U. S. Senate).
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
Washington GPO 1980 75 p Hearing before the Subcomm. on Sci., Technol., and Space of the Comm. on Com., Sci., and Transportation, 96th Congr., 2nd Sess., 19 Sep. 1980
(GPO-68-403) Avail: Subcommittee on Science, Technology, and Space

Problems faced by the industrial and academic communities with regard to scientific research and development are explored. Incentives for technological innovation and the role of science and technology in international relations are stressed. S.F.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N81-25875*# Chrysler Corp., Detroit, Mich.
SUPPORT SERVICES FOR THE AUTOMATIVE GAS TURBINE PROJECT Summary Report
T. Golec, ed. Apr. 1981 148 p
(Contracts DEN3-144; EY-76-C-02-2749)
(NASA-CR-165331; DOE/NASA/0144-81/1) Avail: NTIS HC A07/MF A01 CSCL 13F

Support was provided to DOE and NASA in their efforts to inform industry, the public, and Government on the benefits and purpose of the gas turbine programs through demonstrations and exhibits. Tasks were carried out for maintenance, repair, and retrofit of the experimental gas turbine engines being used by NASA in their gas turbine technology programs and in program demonstrations. Limited support testing was conducted at Chrysler in which data were generated on air bearing rotor shaft dynamics, heavy duty variable sheave rubber belts, high temperature elastomer regenerator drive mounting and graphite regenerator seal friction characteristics. Author

N81-25876*# National Aeronautics and Space Administration, Washington, D. C.
SPINOFF 1981 Annual Report
Apr. 1981 126 p Original contains color illustrations
(NASA-TM-82366) Avail: NTIS MF A01; SOD HC CSCL 05A

Information is provided, designed to heighten awareness of the technology available for transfer and its potential for public benefit. A representative sampling of products and processes resulting from technology utilization, the secondary application of aerospace technology is presented. R.C.T.

N81-25877*# Levine (Arthur L.), New York, N.Y.
THE NASA/BALTIMORE APPLICATIONS PROJECT (BAP). COMPUTER AIDED DISPATCH AND COMMUNICATIONS SYSTEM FOR THE BALTIMORE FIRE DEPARTMENT: A CASE STUDY OF URBAN TECHNOLOGY APPLICATION
Arthur L. Levine Jan. 1981 34 p refs
(NASA Order S-66151-B)
(NASA-CR-166662) Avail: NTIS HC A03/MF A01 CSCL 05K

An engineer and a computer expert from Goddard Space Flight Center were assigned to provide technical assistance in the design and installation of a computer assisted system for dispatching and communicating with fire department personnel and equipment in Baltimore City. Primary contributions were in decision making and management processes. The project is analyzed from four perspectives: (1) fire service; (2) technology transfer; (3) public administration; and (5) innovation. The city benefitted substantially from the approach and competence of the NASA personnel. Given the proper conditions, there are distinct advantages in having a nearby Federal laboratory provide assistance to a city on a continuing basis, as is done in the Baltimore Applications Project. A.R.H.

N81-25878# Public Technology, Inc., Washington, D. C.
PRIMARY URBAN ENERGY-MANAGEMENT-PLANNING METHODOLOGY, A MANAGEMENT REPORT
Nov. 1980 36 p Prepared jointly with Office of Energy Management, Dade County, Fla.; Joint Center for Environmental and Urban Problems, Miami; New York City Energy Office, N.Y.; Cooper Union, New York, N.Y.
(DOE/IR-05106/1) Avail: NTIS HC A03/MF A01

A Primary Urban Energy Management Planning Methodology, which provides local governments with the systematic approach for dealing with short and intermediate term urban energy management problems while at the same time laying the groundwork for the formulation of long term energy management activities, is described. The five tasks of the methodology are: organizing; performing an energy use and supply inventory; formulating energy management goals and objectives; developing strategies to achieve the energy management objectives; and monitoring and evaluation. DOE

N81-25879# Exide Management and Technology Co., Yardley, Pa.
RESEARCH, DEVELOPMENT, AND DEMONSTRATION OF LEAD-ACID BATTERIES FOR ELECTRIC-VEHICLE PROPULSION Annual Report
Mar. 1981 229 p refs 2 Vol.
(Contract W-31-109-eng-38)
(ANL/OEPM-80-11) Avail: NTIS HC A11/MF A01

The investigation of 32 component variables based on a flat pasted positive plate configuration is described. Two concentrations of battery grade sulfuric acid were included in the test to determine if an increase in concentration would improve the battery capacity sufficient to offset the added weight of the more concentrated solution. An experiment was designed to study the relationship of 32 component variables based on a turbular positive plate configuraton. Seventy-five batteries remain on cycle life testing with 17 batteries having in excess of 365 life cycles. The tubular positve plate is far more capable of withstanding deep cycles than is the flat pasted plate; as presently designed 40 Whr/kg cannot be achieved, since 37.7 Whr/kg was the best tubular data obtained; electrolyte circulation is impaired due to the tight element fit in the container; and a redesign is required to reduce the battery weight which will improve the Whr/kg value. DOE

N81-25880# Eltra Corp., Plymouth Meeting, Pa. C and D Batteries Div.
RESEARCH, DEVELOPMENT, AND DEMONSTRATION OF LEAD-ACID BATTERIES FOR ELECTRIC VEHICLE PROPULSION Annual Report
G. W. Bodamer, G. C. Branca, H. R. Cash, G. L. Davis, and E. M. Yurick Mar. 1981 75 p refs 2 Vol.
(Contract W-31-109-eng-38)
(ANL/OEPM-80-10) Avail: NTIS HC A05/MF A01

The progress and status of Eltra's Electric Vehicle Battery Program during FY-80 are presented under five divisional headings: Research on Components and Processes; Development of Cells and Modules for Electric Vehicle Propulsion; Sub-Systems; Pilot Line Production of Electric Vehicle Battery Prototypes; and Program Management. DOE

N81-25881# Department of Energy, Washington, D. C. Office of Transportation Programs.
ELECTRIC AND HYBRID VEHICLE PROGRAM. FOURTH REPORT TO CONGRESS FOR FY 1980 Annual Report
Jan. 1981 132 p refs
(DOE/CS-0130/4; AR-4) Avail: NTIS HC A07/MF A01

Implementation of the Electric and Hybrid Vehicle Research, Development and Demonstration Act of 1976 (Public Law 94-413, as amended by Public Law 95-238, referred to as the Act) is described. During FY 1980, significant progress was made toward implementing the policies established by Congress in the Act. A noticeable increase in interest was shown by both the market and the supply segments of the economy in electric and hybrid vehicles. The demonstration site operators increased in number to 68 with demonstration sites located in 94 cities across the Nation. Loan guarantees were awarded to two electric vehicle manufacturers. Research and development efforts in batteries and propulsion components, as well as total vehicle systems, continue to make progress toward providing industry with technology options that will result in vehicles with greater public acceptance. DOE

N81-25882# Washington Univ., Seattle. Dept. of Civil Engineering.
PLANNING AND DESIGNING A TRANSIT CENTER BASED TRANSIT SYSTEM: GUIDELINES AND EXAMPLES FROM CASE STUDIES IN TWENTY TWO CITIES
Jerry B. Schneider, Stephen P. Smith, Paul D. Thompson, James L. Heid, and Irene W. Ng Sep. 1980 133 p refs
(PB81-154569; UMTA-WA-11-007-81-1; UPP-30) Avail: NTIS HC A07/MF A01 CSCL 13F

Present metropolitan level patterns in American cities are examined. The inability of high downtown focused transit networks to meet metropolitan travel needs in American cities is discussed. In addition, the grid network approach to route planning is critiqued. A planning framework consisting of 10 steps and designed to aid planners design transit centers is presented. Each step of the process is illustrated with examples from 22 case studies which include four Canadian, one Indian, and one West German city. Regional shopping centers are suggested to be ideal sites for transit center locations. The transit center oriented network is assessed critically from an operational, financial, and political perspective. GRA

N81-25883# General Motors Technical Center, Warren, Mich. Transportation Systems Div.
SYSTEMS OPERATION STUDIES FOR AUTOMATED GUIDEWAY TRANSIT SYSTEMS: REPRESENTATION APPLICATION AREAS FOR AGT Final Report, Nov. 1978 - May 1980
Robert W. Cowan, Loren S. Bonderson, and Femia S. A. Alberts Nov. 1980 223 p refs
(Contract DOT-TSC-1220)
(PB81-154551; DOT-TSC-UMTA-80-30; UMTA-MA-06-0048-80-7) Avail: NTIS HC A10/MF A01 CSCL 13F

Travel demands and guideway networks are defined for a set of representative automated guideway transit (AGT) system deployments. These demands and networks, when combined with detailed descriptions of the systems and their operating characteristics, define the represeritative systems to be modeled and analyzed. Seven demand types, including three metropolitan areas, two central business districts, and two activity centers are defined, and a representative locale of each type is chosen. Station-to-station demands generated after the process for generating zone-to-zone demands for the metropolitan area applications are also presented. The following seven guideway network types are defined: shuttle; loop; one-way loop; two-way loop; multiple loop; partially connected grid; and fully connected grid. GRA

N81-25884# Connecticut Univ., Storrs. Dept. of Civil Engineering.
DEVELOPMENT AND EXPERIMENTAL EVALUATION OF A STEEL PIPE VEHICLE IMPACT ATTENUATION SYSTEM. REPORT ON MODEL TESTS CONDUCTED AT THE UNIVERSITY OF CAMBRIDGE, ENGLAND Progress Report, May - Jun. 1980
John F. Carney Jul. 1980 37 p
(PB81-155186; CE-80-136; HPR-722) Avail: NTIS HC A03/MF A01 CSCL 13F

Quasi-static and dynamic (impact) model testing is described. Over forty individual tests were run. The tests ranged from the quasi-static loading of single steel tubes to the impact loading of complete systems. All tests were conducted with mild steel seamless tubing (Specification B.S. 980 1950 CDS 2). The experiments demonstrate the feasibility of conducting full-scale crash tests on clusters of steel tubes as stationary impact attenuating devices. GRA

88 SPACE SCIENCES (GENERAL)

N81-25885# Academy of Sciences (USSR), Moscow. Space Research Inst.
ON NUMERICAL VALUES OF FUNDAMENTAL CONSTANTS
I. L. Rosental 1980 22 p refs
(Rept-608) Copyright. Avail: Issuing Activity

The ranges of numerical values of fundamental constants within which basic stable bound states exist (that is nuclei, atoms, stars, and galaxies) are examined. Narrow admissible intervals

are evidence to a set of initial conditions for the formation of universes. The analysis shows that fundamental constants are formed at the very beginning of an expansion stage of universe, with the fluctuation law as a basis. M.G.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N81-25886 Washington Univ., Seattle.
AN OBSERVATIONAL STUDY OF HERBIG-HARO NEBULAE Ph.D. Thesis
Edward William Brugel 1981 192 p
Avail: Univ. Microfilms Order No. 8109715

Optical emission line fluxes are presented for Herbig Haro objects. Values for the electron temperature and electron density were determined for ten of these condensations. Significant inhomogenities in the line forming regions of these H-H objects are indicated by the derived Ne-Te diagrams. Empirical two-component density models were constructed to interpret the emission line spectra of the five brightest condensations. With the aid of these models, ionic abundances for OI, OII, OIII, NI, NII, SII, CaII, NeIII, CI and MgI were determined. In all observed nebulae, these abundances are consistent with 'cosmic' population I elemental abundances. There is no evidence for enhanced dust formation inside any Herbig-Haro object, as illustrated by the derived normal 'cosmic' abundances of Ca and Fe. Specific spectral line features seen in H-H7 and H-H 11 place these objects into a class of very low excitation H-H objects of which H-H 47 has been the only known example. Dissert. Abstr.

N81-25887*# National Aeronautics and Space Administration, Washington, D. C.
RADIO ASTRONOMICAL SPACE SYSTEM OF APERTURE SYNTHESIS: FILLING OF THE SPATIAL FREQUENCY SPECTRUM
N. S. Kardashev, S. V. Pogregenko, and G. S. Tsarevskiy Jun. 1980 36 p refs Transl. into ENGLISH of "Radioastronomicheskaya Kosmicheskaya Sistema Aperturnogo Sinteza: Zapolneniye Spektra Prostranstvennykh Chastot" Rept. Pr-449 Moscow, 1978 50 p Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Inst. of Space Research, Academy of Sciences (USSR), Moscow
(Contract NASw-3198)
(NASA-TM-76176; Pr-449) Avail: NTIS HC A03/MF A01 CSCL 03A

The information potential of radio astronomical space systems of aperture synthesis is examined. Ground based and space radio telescopes are included. Author

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N81-25888 California Univ., Santa Cruz.
CARBON AND NITROGEN ABUDANCES IN THE GLOBULAR CLUSTERS M3 AND M13 Ph.D. Thesis
Nicholas Boris Suntzeff 1980 150 p
Avail: Univ. Microfilms Order No. 8107710

The C and N abundance properties common to both clusters are: (1) stars on the asymptotic giant branch (AGB) have carbon down by at least a factor of two compared to subgiant branch (SGB) stars at the same temperature; (2) there are a few pairs of stars in each cluster which lie close together in the color magnitude diagram which nevertheless show differences in C or N abundances by a factor of 3; (3) the carbon plus nitrogen abundance is constant for all stars observed in each cluster; (4) stars near the tip of the red giant branch (RGB) and all the AGB stars have (C/Fe) down by at least -0.6 dex and (N/FE) up by 0.3 dex. The C and N abundances for RGB and AGB stars are about the same; (5) carbon appears to be anticorrelated with nitrogen; (6) the average carbon abundance falls by a factor of two along the RGB from M sub v approximately +0.5 to the red giant tip. The behavior of carbon and nitrogen abundances as a function of evolutionary state indicates that carbon is processed into nitrogen as a star evolves up the RGB.
Dissert. Abstr.

N81-25889# Academy of Sciences (USSR), Moscow. Space Research Inst.
THE STRUCTURE OF THE SPACE-TIME AND PHYSICAL PROCESSES INSIDE THE BLACK HOLES
I. D. Novikov and A. A. Starobinsky 1980 9 p refs
(Rept-585) Copyright. Avail: Issuing Activity

The existence of the Cauchy horizon in the general case of a real physical body collapse is studied. The evolution of physical fields and quantum effects inside the black holes are discussed. S.F.

N81-25890# Academy of Sciences (USSR), Moscow. Space Research Inst.
THE STAGE OF THE SUPERHEAVY PARTICLE DOMINANCE IN THE UNIVERSE AND PRIMORDIAL BLACK HOLES
M. Yu. Khlopov and A. G. Polnarev 1980 25 p refs
(Rept-578) Copyright. Avail: Issuing Activity

The stage of nonrelativistic superheavy particle dominance in the early Universe is predicted within the frame of grand unified theories of elementary particles. The minimal probability of primordial black hole (PBH) formation at this stage is estimated and compared with astrophysical upper limits of the PBH density. Astrophysical restrictions on grand unified theories are obtained. M.G.

N81-25891# Academy of Sciences (USSR), Moscow. Space Research Inst.
INSTANTONS IN THE QUARK PLASMA. THE TWO LOOP APPROXIMATION
A. A. Abrikosov, Jr. 1981 40 p refs
(Rept-577) Copyright. Avail: Issuing Activity

The thermodynamics of the quark plasma is studied by means of the exact Green functions in the instanton field. The correction to the instanton action due to the interaction with cold (T approaches 0) plasma of the light quarks is computed up to the g(2)-terms. The action falls abruptly when the instanton radius increases and the effects of instanton suppression by plasma are absent. Large instantons are strongly distorted by plasma and there are no instantons greater than the Debye radius. M.G.

N81-25892 Academy of Sciences (USSR), Moscow. Space Research Inst.
SPIRAL STRUCTURES OF GALAXIES: TWO ALTERNATIVES
L. S. Marochnik and A. A. Suchov 1981 15 p refs
(Rept-621) Copyright. Avail: Issuing Activity

Two alternative wave theories of the spiral structure of the galaxies are tested. The long wave mode, which corresponds to the wave having an angular rotation velocity and a radial group velocity directed from the center of the galaxy to its periphery, is favored. S.F.

N81-25893*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE UNIVERSE AT ULTRAVIOLET WAVELENGTHS: THE FIRST TWO YEARS OF INTERNATIONAL ULTRAVIOLET EXPLORER
Robert D. Chapman, ed. 1981 773 p refs Proceedings of a symp. held in Greenbelt, Md., 7-9 May 1980
(NASA-CP-2171) Avail: NTIS HC A99/MF A01 CSCL 03B

Highlights of the results obtained from the IUE satellite are addressed. specific topics discussed include the solar system, O-A stars, F-M stars, binary stars and highly evolved objects, nebulae and interstellar medium, and extragalactic objects. Data reduction techniques employed in the analysis of the varied data are also discussed. For individual titles, see N81-25894 through N81-25985.

N81-25894*# Washington Univ., Seattle.
OUTLOOK FOR ULTRAVIOLET ASTRONOMY
Erika Boehm-Vitense *In* NASA. Goddard Space Flight Center

The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 3-17 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

A brief overview of galactic and extragalactic research is given with emphasis on the problems of temperature determination, chemical abundance determination, and the question about the energy sources for the high temperature regions. Stellar astronomy, stellar winds, and the interstellar medium are among the topics covered. J.M.S.

N81-25895*# Johns Hopkins Univ., Baltimore, Md. Dept. of Physics.
NEW INSIGHT INTO THE PHYSICAL STATE OF SOLAR SYSTEM OBJECTS
P. D. Feldman *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 21-25 refs (For primary document see N81-25893 16-90)
(Grant NsG-5393)
Avail: NTIS HC A99/MF A01 CSCL 03B

The application of IUE to observations of solar system objects is summarized and a brief survey of discoveries made during the first two years of IUE operation is given. Author

N81-25896*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HIGH-RESOLUTION OBSERVATION OF THE VENUS DAYGLOW SPECTRUM 1250-1430 ANGSTROMS
A. L. Lane, Samuel T. Durrance, Robert R. Conway, and Charles A. Barth *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 27-31 refs Prepared in cooperation with Colorado Univ., Boulder (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

The spectrum of the dayglow of Venus between 1250 and 1430 A was measured in high resolution with the International Ultraviolet Explorer. Seven exposures which were made with the short wavelength camera in the high dispersion mode using the large aperture were combined to give a total exposure time of 309 min. The atomic oxygen lines at 1302.2, 1304.9, 1306.0, and 1355.6 A are present. In addition, the (14,3) and (14,4) bands of the carbon monoxide fourth positive system at 1317 and 1354 A respectively are identified. These bands are compared with synthetic spectra, showing the excitation mechanism to be fluorescent scattering of solar Lyman alpha radiation. Author

N81-25897*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SEASONAL OBSERVATION OF MARS
A. L. Lane, Robert R. Conway, Samuel T. Durrance, and Charles A. Barth *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 33-37 refs Prepared in cooperation with Colorado Univ., Boulder (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

The International Ultraviolet Explorer detected the Hartley bands of ozone in the spectrum of Mars. Seasonal observations show a variation in the north consistent with the measurement of Mariner 9. Observations during Martian late fall in the south were also made. Author

N81-25898*# Johns Hopkins Univ., Baltimore, Md. Dept. of Physics.
SPATIAL IMAGING OF UV EMISSION FROM JUPITER AND SATURN
J. T. Clarke and H. W. Moos *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 39-44 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

Spatial imaging with the IUE is accomplished both by moving one of the apertures in a series of exposures and within the large aperture in a single exposure. The image of the field of view subtended by the large aperture is focussed directly onto the detector camera face at each wavelength; since the spatial resolution of the instrument is 5 to 6 arc sec and the aperture extends 23.0 by 10.3 arc sec, imaging both parallel and perpendicular to dispersion is possible in a single exposure. The correction for the sensitivity variation along the slit at 1216 A is obtained from exposures of diffuse geocoronal H Ly alpha emission. The relative size of the aperture superimposed on the apparent discs of Jupiter and Saturn in typical observation is illustrated. By moving the planet image 10 to 20 arc sec along the major axis of the aperture (which is constrained to point roughly north-south) maps of the discs of these planets are obtained with 6 arc sec spatial resolution. J.M.S.

N81-25899*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
OBSERVATIONS OF POLAR AURORA ON JUPITER
A. L. Lane, J. T. Clarke, H. W. Moos, and S. K. Atreya *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 45-48 refs Prepared in cooperation with Johns Hopkins Univ., Baltimore and Michigan Univ., Ann Arbor (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

North-south spatial maps of Jupiter were obtained with the SWP camera in IUE observations of 10 December 1978, 19 May 1979, and 7 June 1979. Bright auroral emissions were detected from the north and south polar regions at H Ly alpha (1216 A) and in the H2 Lyman bands (1250-1608 A) on 19 May 1979; yet no enhanced polar emission was detected on the other days. The relationship between the IUE observing geometry and the geometry of the Jovian magnetosphere is discussed. Author

N81-25900*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
OBSERVATIONS OF THE IO PLASMA TORUS
A. L. Lane, H. W. Moos, J. T. Clarke, and S. K. Atreya *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 49-53 refs Prepared in cooperation with Johns Hopkins Univ., Baltimore and Michigan Univ., Ann Arbor (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

The short wavelength spectrography on the IUE satellite was used to obtain spectra of the plasma torus near the orbit of Io about Jupiter. Three exposures of about 8 hours each taken in March and May 1979 show emission features due to SII, SIII, and OIII. The absence of features at other wavelengths permits upper limits to be other species in the torus. J.M.S.

N81-25901*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANALYSIS OF IUE OBSERVATIONS OF CS IN COMET BRADFIELD (1979 L)
J. Rahe, W. M. Jackson, J. Halpern, and P. D. Feldman *In its* The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 55-64 refs Prepared in cooperation with Howard Univ. and Johns Hopkins Univ., Baltimore (For primary document see N81-25893 16-90)
(Grants NaG-5071; NsG-5393)
Avail: NTIS HC A99/MF A01 CSCL 03B

The high resolution rotational band profiles were fitted with theoretical band profiles which are derived using a Boltzmann temperature of 70 K. A very rapid variation with heliocentric distance for the CS brightness was found. The implications of these results for models of the coma along with the origin of the CS species are discussed. T.M.

N81-25902*# Johns Hopkins Univ., Baltimore, Md. Dept. of Physics.
WATER PRODUCTION MODELS FOR COMET BRADFIELD (1979 L)
H. A. Weaver, P. D. Feldman, and M. C. Festou (Michigan Univ., Ann Arbor) *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 65-72 refs (For primary document see N81-25893 16-90)
(Grant NsG-5393)
Avail: NTIS HC A99/MF A01 CSCL 03B

The IUE observations of Comet Bradfield (1979 I) made

10 January 1980 to 3 March 1980 permit a detailed study of water production for this comet. Brightness measurements are presented for all three water dissociation products, H, O, and OH, and comparisons are made with model predictions. The heliocentric variation of the water production rate was derived. T.M.

N81-25903*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FLUORESCENCE EQUILIBRIUM IN THE ULTRAVIOLET SPECTRA OF COMETS SEARGENT (1978 M) AND BRADFIELD (1979 L)
Bertram Donn, Michael F. AHearn, David G. Schleicher, and William M. Jackson *In its* The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 73-81 refs Prepared in cooperation with Maryland Univ., College Park and Howard Univ. (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

Detailed fluorescence calculations for OH including the Swings effect were performed. These calculations were used to reproduce the high resolution spectra of Comets Seargent and Bradfield taken with IUE. The calculations also provide the OH fluorescence efficiencies (g factors), as a function of heliocentric radial velocity, which are needed to derive OH abundances from measured fluxes. A close examination of the spectra shows no sign of the corresponding emission bands of OD allowing upper limits to be placed on the ratio N(OD)/N(OH). Preliminary attempts to reproduce the CO+ band structure by fluorescence are discussed. M.G.

N81-25904*# European Space Technology Center, Noordwijk (Netherlands). Astronomy Div.
OBSERVATION OF OUTER PLANETS AT LYMAN ALPHA
Jon Darius and K. H. Fricke (Bonn Univ.) *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 85-87 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

A triple planetary observation in one IUE shift was conducted to measure the Lyman alpha reflectivity of Jupiter, Saturn and Uranus. The exposures were planned to take account of the light travel times, Sun to planet and planet to Earth, in order to assess the response of the three atmospheres to essentially the same incident solar flux. All additional uncertainties that were introduced when different instruments were used for such a comparative measurement were automatically eliminated. T.M.

N81-25905*# Astronomical Inst., Utrecht (Netherlands). Space Research Lab.
NEW INSIGHT INTO THE PHYSICS OF ATMOSPHERES OF EARLY TYPE STARS
Henny J. G. L. M. Lamers *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 93-103 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

The phenomenon of mass loss and stellar winds from hot stars are discussed. The mass loss rate of early type stars increases by about a factor of 100 to 1000 during their evolution. This seems incompatible with the radiation driven wind models and may require another explanation for the mass loss from early type stars. The winds of early type stars are strongly variable and the stars may go through active phases. Eclipses in binary systems by the stellar winds can be used to probe the winds. A few future IUE studies are suggested. T.M.

N81-25906*# Stockholm Observatory (Sweden).
IUE OBSERVATIONS OF YOUNG VARIABLES
Goesta F. Gahm *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 105-114 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

A number of far UV spectrograms of young variable stars have become available through observations with the IUE satellite. Several T Tauri stars and Herbig type Be- and Ae-stars in dark nebulae were observed and spectrograms of a total of 17 stars, which were considered to be very young pre-main-sequence stars, were collected. In many of these cases only part of the spectral region available at the IUE is covered and there are examples where large spectral regions are severely underexposed. With a few exceptions, the stars have been observed with the low resolution cameras, providing spectra resolutions of 6 to 7 A. T.M.

N81-25907*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
MASS-LOSS RATES FROM EARLY-TYPE STARS
Peter S. Conti and Catharine D. Garmany *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 115-120 refs (For primary document see N81-25893 16-90)
(Contract NAS5-22833)
Avail: NTIS HC A99/MF A01 CSCL 03B

The mass loss rates are derived for a number of unevolved O-type stars and a few WN stars from high dispersion IUE spectra of their P Cygni profiles. When combined with other published mass loss rates, it is found that the relationship between log m and M sub BOL is a broad band rather than a linear relation, suggesting that the line radiation driven wind theory may not be sufficient to explain mass loss. The mass loss rates for the WN stars, while more uncertain, confirm that these stars lose mass about 100 times faster than O-stars. M.G.

N81-25908*# Colorado Univ. at Boulder. Lab. for Atmospheric and Space Physics.
IUE OBSERVATIONS OF VARIABILITY IN WINDS FROM HOT STARS
C. A. Grady and Theodore P. Snow, Jr. *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 121-125 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

Observations of variability in stellar winds or envelopes provide an important probe of their dynamics. For this purpose a number of O, B, Be, and Wolf-Rayet stars were repeatedly observed with the IUE satellite in high resolution mode. In the course of analysis, instrumental and data handling effects were found to introduce spurious variability in many of the spectra. software was developed to partially compensate for these effects, but limitations remain on the type of variability that can be identified from IUE spectra. With these contraints, preliminary results of multiple observations of two OB stars, one Wolf-Rayet star, and a Be star are discussed. Author

N81-25909*# Wisconsin Univ. - Madison.
ANOMALOUS IONIZATION SEEN IN THE SPECTRA OF B SUPERGIANTS
Joseph P. Cassinelli and David C. Abbott *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 127-134 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

An IUE survey of B supergiants has been conducted to study the persistence with spectral type of the ultraviolet resonance lines of N V, C IV and Si IV. N V is seen as late as B2.5Ia, C IV until B6Ia and Si IV throughout the range from B1.5 to B9. This is in fairly good agreement with the Auger ionization model of Cassinelli and Olson (1979). The terminal velocities are derived for the 20 stars in the sample and it is found that the ratio v(T)/v(esc) decreases monotonically with spectral type from the value of 3.0 that it has in the O spectral range to the value 1.0 at B9Ia. Author

N81-25910*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ABSOLUTE ENERGY CURVES FROM LATE B-TYPE SUPERGIANTS
Anne B. Underhill *In its* The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 135-140 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

Energy curves were determined for six late B and early A type supergiants using IUE data and other ultraviolet and ground based photometry. Effective temperatures and angular diameters are presented as well as estimates of the outflow velocity of the wind. All six stars show a strong Balmer continuum in

emission; the Ia supergiants also show an infrared excess which reaches into the visible range. Evidence is found for the presence of a warm mantle as well as for wind from the Ia stars. A.R.H.

N81-25911*# European Space Technology Center, Noordwijk (Netherlands).
IUE AND GROUND-BASED OBSERVATIONS OF MASS-LOSS IN THE MAGELLANIC CLOUDS
F. Macchetto, P. Benvenuti (ESA, Madrid), S. DOdorico (European Southern Observatory, Geneva), and N. Panagia (Inst. di Radioastronomia, Bologna) *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 141-148 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

Ground based and IUE observations of hot stars in the large and small Magellanic Clouds were carried out to investigate the mass loss process in these objects and to search for differences with galactic hot stars. Preliminary results show that in a large proportion of the stars observed the mass loss process is taking place. A mechanism for acceleration of the wind in OB stars is proposed. Author

N81-25912*# Observatoire de Paris (France).
PROPOSED THREE-PHASE MODELING OF Be STARS FROM COMBINED UV AND VISUAL OBSERVATIONS
V. Doazan, R. Stalio, and R. N. Thomas *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 149-155 refs Prepared in cooperation with Osservatorio Astronomico di Trieste and Inst. d'Astrophysique, Paris (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

Far ultraviolet observations of the behavior of wind velocity and superionization values as a function of the phase of the (Be, B shell, B normal) pattern established by visual observations for gamma Cas and 59 Cyg are translated into a crude atmospheric model for the Be phase and several kinds of mass flux variability across the three phases. Author

N81-25913*# University of Southern California, Los Angeles. Dept. of Astronomy.
OBSERVATIONS OF THE GAS STREAM IN THE MASS TRANSFER BINARY HR 2142 PRIME 1
Geraldine J. Peters *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 157-165 refs (For primary document see N81-25893 16-90)
(Grant NsG-5422)
Avail: NTIS HC A99/MF A01 CSCL 03B

The mass transfer binary system HR 2142 was observed at selected phases with the high resolution spectrograph on IUE. The observations were scheduled throughout the interval 0.91 < phi < 0.00 in order to allow viewing of the light of the primary star through the gas stream as it presents different orientations to the line of sight. Numerous UV lines formed in the gas stream were identified. The strengths and velocity variations displayed by these lines are compared with those observed in the ground based spectral region. As part of a preliminary analysis of the IUE data, column densities and velocities from Si III (4), Si IV (1), and Ti III (1) are used to deduce electron densities in the gas stream as well as its thickness. Possible evidence for stratification in the gas stream is presented. Author

N81-25914*# Wien Univ. (Austria). Inst. for Astronomy.
THE UV RESONANCE LINES OF THREE HOT Ap STARS: HD 133029, HD 175362 AND HD 219749
Karl D. Rakos *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 167-176 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

High resolution spectra of the Ap stars HD 133929, HD 175329 and HD 219749 were obtained during two 16 hour shifts with the IUE satellite at Goddard Space Flight Center. Stellar wind, extended atmosphere in rigid corotation with the stellar surface, and the influence of the strong magnetic field on the upper part of the atmosphere would explain the shape and the strength of the resonance lines. The resonance lines of HD 175362 in particular show very peculiar behavior. The necessary driving forces for the expanding envelope are not compatible with the diffusion theory of the Ap atmospheres. Author

N81-25915*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
VARIATIONS IN THE UV SPECTRUM OF A CENTAURI
Richard P. Fahey *In its* The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 177-184 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

Equivalent width and central depth measurements of the ultraviolet absorption lines from the spectrum of the He I variable star a Cen [HD 125823] are presented. The measurements are from 53 short wavelength, and 45 long wavelength, high resolution spectrographs taken with the IUE satellite over a 25 day period during July and August of 1978. Central depth measurements were of lines of Cr III, Mn III, V III, C III, Si II, and S II seen in the region between 1245 and 1255 A. Equivalent widths are of the three He I 2(3)s-n(3po) transitions found at 2945, 2829 and 2764 A. The period for cyclic intensity variations in He I is determined using a four parameter, least squares fit to a sinusoid. The IUE observations match both a period of 8.8163 + or - 0.0003 days and a previously unreported period of 9.2532 + or - 0.0003 days with equal minima for the least squares fit. The phase of Cr III maximum relative to He I maximum is found to be 0.53 cycles for the IUE observations. Author

N81-25916*# Arizona Univ., Tucson.
THE ULTRAVIOLET VARIABILITY OF THE T TAURI STAR RW AURIGAE
Catherine L. Imhoff and Mark S. Giampapa *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 185-191 refs (For primary document see N81-25893 16-90)
(Grant NsG-5235)
Avail: NTIS HC A99/MF A01 CSCL 03B

Between 1978 and 1979 the visible brightness of RW Aurigae increased by 0.9 mag. During this time (1) CIV and SiIV increased by factors of 2 to 4 while the lower ionization lines remained unchanged; (2) the fluorescent OI line increased by a factor of 8; (3) the shell spectrum changed from emission to absorption; and (4) the ultraviolet continuum brightened by 2.3 mag. On a time scale of a week the continuum varied by as much as 0.8 mag., but the MgII emission lines showed no variability over 10 percent. An active chromosphere, transition region, and envelope cooled by mass loss are hypothesized in order to explain the ultraviolet observations of RW Aur. A.R.H.

N81-25917*# Osservatorio Astronomico, Trieste (Italy).
IUE OBSERVATIONS OF BLUE HALO HIGH LUMINOSITY STARS
Margherita Hack, Margarita L. Franco, and Roberto Stalio *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 193-199 refs Sponsored in part by CNR (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

Two high luminosity population II blue stars of high galactic latitude, BD+33 deg 2642 and HD 137569 were observed at high resolution. The stellar spectra show the effect of mass loss in BD+33 deg 2642 and abnormally weak metallic lines in HD 137569. The interstellar lines in the direction of BD+33 deg 2642, which lies at a height z greater than or equal to 6.2 kpc from the galactic plane, are split into two components. No high ionization stages are found at the low velocity component; nor can they be detected in the higher velocity clouds because of mixing with the corresponding stellar/circumstellar lines. Author

N81-25918*# Osservatorio Astronomico, Trieste (Italy).
THE EMISSION/ABSORPTION FE 2 SPECTRUM OF HD 45677
Roberto Stalio and P. L. Selvelli *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 201-207 (For primary document see N81-25893 16-90)

Avail: NTIS HC A99/MF A01 CSCL 03B

The complex behavior of the emission/absorption spectrum of Fe II is analyzed. The far UV spectrum is characterized almost solely by absorption lines, while, in the near UV, strong emissions are predominant. Radiative excitation from the ground to the highest levels (chi is approximately 10 eV) with re-emission in the near UV, visible and I.R. seems to be the main mechanism capable of explaining the observed spectral features. Author

N81-25919*# Naval Research Lab., Washington, D. C. Center for Space Research.

THE DETECTION OF COMPANION STARS TO THE CEPHEID VARIABLES ETA AQUILAE AND T MONOCEROTIS

John T. Mariska, G. A. Doschek, and U. Feldman *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 209-215 refs (For primary document see N81-25893 16-90)

Avail: NTIS HC A99/MF A01 CSCL 03B

Ultraviolet spectra of the classical Cepheid variables eta Aq1 and T Mon at several phases in their periods were obtained with IUE. For eta Aq1 significant ultraviolet emission is detected at wavelengths less than 1600 A, where little flux is expected from classical Cepheids. Furthermore, the emission at wavelengths less than about 1600 A does not vary with phase. Comparison with model atmosphere flux distributions shows that the nonvariable emission is consistent with the flux expected from a main sequence companion star with an effective temperature of about 9500 K (AO V - A1 V). For T Mon a nonvarying component to the ultraviolet emission is observed for wavelengths less than 2600 A. Comparison with model atmosphere flux distributions suggests that the companion has an effective temperature of around 10,000 K (A0) and is near the main sequence. A.R.H.

N81-25920*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

LINE STRENGTH VARIATIONS IN BETA CEPHEI

David Fischel and Warren M. Sparks *In its* The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 217-224 refs (For primary document see N81-25893 16-90)

Avail: NTIS HC A99/MF A01 CSCL 03B

The line strength variations of the resonance line of C IV (1550A, 2s 2S - 2P) observed by OAO-2 were confirmed by IUE observations. In addition, the NV resonance line (1204A, 2s 2S - 2P), the Si III line (1206A, 3p 1P-1D, multiplet 11) and the Si IV resonance line (1395A, 3s 2S - 2P) all vary in line strength essentially in phase with the C IV variation. The (preliminary) period of the variation is 6.02/12.04 days. Author

N81-25921*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.

AN IUE'S EYE VIEW OF COOL-STAR OUTER ATMOSPHERES

Tom R. Ayres *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 237-278 refs (For primary document see N81-25893 16-90)

(Contract NAS5-23274; Grant NGL-06-003-057)
Avail: NTIS HC A99/MF A01 CSCL 03B

Three topics are discussed which together demonstrate the power of the IUE to probe the occurrences of chromospheres and coronae in the cool half of the HR diagram. These are: (1) the complementary low dispersion and echelle observing modes; (2) Mg II h and k: chromospheric cooling and width luminosity correlation; and (3) empirical correlations among chromospheric, transition region, and coronal emission. The spectra of alpha Centauri (G2 V + K1 V) and Capella (G6 III + F9 III) are compared with that of the Sun and recent low dispersion surveys of cool star emission in the 1150 A to 2000 A short wavelength region are summarized. A.R.H.

N81-25922*# Arizona Univ., Tucson.

THE Mg 2 h AND k LINES IN A SAMPLE OF dMe AND dM STARS

Mark S. Giampapa, P. L. Pornmann, Tom R. Ayres, J. L. Linsky, and S. P. Worden *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 279-286 refs Prepared in cooperation with Colorado Univ., Boulder; Joint Inst. for Lab. Astrophysics and California Univ., Los Angeles (For primary document see N81-25893 16-90)

(Contract NAS5-23274)
Avail: NTIS HC A99/MF A01 CSCL 03B

Both Mg II h and k line fluxes are presented for a sample of 4 dMe and 3 dM stars obtained with the IUE satellite in the long wavelength, low dispersion mode. The observed fluxes are converted to stellar surface flux units and the importance of chromospheric non radiative heating in this sample of M dwarf stars is intercompared. In addition, the net chromospheric radiative losses due to the Ca II H and K lines in those stars in the sample for which calibrated Ca II H and K line data exist are compared. Active region filling factors which likely give rise to the observed optical and ultraviolet chromospheric emission are estimated. The implications of the results for homogeneous, single component stellar model chromospheres analyses are discussed. A.R.H.

N81-25923*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.

IUE SPECTRA OF F AND LATE A STARS

Jeffrey L. Linsky and Norman C. Marstad *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 287-295 refs (For primary document see N81-25893 16-90)

(Contract NAS5-23274; Grant NGL-06-003-057)
Avail: NTIS HC A99/MF A01 CSCL 03B

The International Ultraviolet Explorer (IUE) spectra of alpha CMi (F5 IV-V), beta Cas (F2 IV), alpha Car (F0 Ib), and gamma Boo (A7 III) in the context of the question as to whether chromospheres disappear in the early F late A portions of the Hertzsprung-Russell diagram. Both alpha CMi (Procyon) and beta Cas show bright emission line spectra indicative of chromospheres and transition regions, but neither alpha Car (Canopus) nor gamma Boo show any evidence of emission in their SWP spectra or at the Mg II lines, despite very deep exposures. Alpha CMi has emission line fluxes roughly 6 times those of the quiet Sun, but the rapidly rotating delta Scuti type variable beta Cas has surface fluxes 10 to 50 times those of the quiet Sun. Upper limits on emission line fluxes for alpha Car are 4 to 20 and for gamma Boo 15 to 80 times the quiet Sun. It is concluded that the apparent absence of emission lines in the spectra of alpha Car and gamma Boo should not be interpreted as due to the absence of nonradiatively heated outer atmospheres in stars hotter than spectral type F0, but rather to the inability to see emission lines with IUE against a background of scattered light and a bright photospheric absorption line spectrum either in low or high dispersion. M.G.

N81-25924*# Oxford Univ. (England). Dept. of Theoretical Physics.

THE STRUCTURE OF CHROMOSPHERES AROUND LATE-TYPE GIANTS AND SUPERGIANTS

A. Brown, M. Ferraz, and C. Jordan *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 297-302 refs (For primary document see N81-25893 16-90)

Avail: NTIS HC A99/MF A01 CSCL 03B

Observations alpha Tau (K5III) and beta Gru (M2II) made at high resolution are used to confirm line identifications of features blended at low resolution. The high resolution spectra allow selected pairs of lines to be used to find the electron density and the opacity. Methods for determining these factors and the usual emission measure are presented. The electron density and opacity can be used together with the emission measure to place constraints on the structure of the atmosphere. The line formation processes are briefly discussed. Photo-excitation by strong lines appears to be important in these late type atmospheres. M.G.

N81-25925*# Washington State Univ., Pullman.

THE CHROMOSPHERIC AND TRANSITION LAYER EMISSION OF STARS WITH DIFFERENT METAL ABUNDANCES

Erika Boehm-Vitense *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 303-309 refs (For primary

document see N81-25893 16-90)
(Grant NsG-5398)
Avail: NTIS HC A99/MF A01 CSCL 03B

Preliminary results on observations of chromospheric and transition layer emission of stars with different metal abundances are reported. Metal deficient stars generally show reduced emission in the Mg II resonance lines and also in the other chromospheric and transition layer emission lines. This is interpreted as showing that energy fluxes other than acoustic fluxes must at least be coresponsible for the coronal and transition layer heating. M.G.

N81-25926*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
UV CHROMOSPHERIC AND CIRCUMSTELLAR DIAGNOSTIC FEATURES AMONG F SUPERGIANT STARS
Robert E. Stencel, Simon P. Worden (Sacramento Peak Observatory), and Mark S. Giampapa (Arizona Univ., Tucson) *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 311-316 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

A survey of F supergiant stars to evaluate the extension of chromospheric and circumstellar characteristics commonly observed in the slightly cooler G, K, and M supergiant is discussed. An ultraviolet survey was elected since UV features of Mg II and Fe II might persist in revealing outer atmosphere phenomena even among F supergiants. The encompassed spectral types F0 to G0, and luminosity classes Ib, Ia, and Ia-0. In addition, the usefulness of the emission line width-to-luminosity correlation for the G-M stars in both the Ca II and Mg II lines is examined. M.G.

N81-25927*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
HIGH RESOLUTION ABSOLUTE FLUX PROFILES OF THE MC 2 h AND k LINES IN EVOLVED F8 TO M5 STARS
Robert E. Stencel, Dermott J. Mullan (Delaware Univ.), Gibor S. Basri (California Univ. at Berkeley), and Jeffrey L. Linsky *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 317-324 refs (For primary document see N81-25893 16-90)
(Contracts NAS5-23274; NAS5-25762)
Avail: NTIS HC A99/MF A01 CSCL 03B

The central results of a survey of the Mg II resonance line emission in a sample of over 50 evolved late type stars, including spectral-luminosity type F8 to M5 and La to IV are presented. Observed and surface fluxes are derived and correlations noted. The major findings include: (1) Mg II k emission core asymmetry transition near K1 III, analogous to that known for Ca II K; (2) a small gravity and temperature dependence of the Mg II chromospheric radiative loss rate. M.G.

N81-25928*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
IUE-ULTRAVIOLET AND OPTICAL CHROMOSPHERIC STUDIES OF LATE-TYPE GIANTS IN THE HYADES CLUSTER
S. L. Baliunas, L. Hartmann, and A. K. Dupree *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 325-331 refs (For primary document see N81-25893 16-90)
(Grants NsG-5370; NAG5-5)
Avail: NTIS HC A99/MF A01 CSCL 03B

Ultraviolet and optical observations of four bright, late-type giants in the Hyades cluster detected with IUE are presented in order to study chromospheric and coronal activity in stars of the same age. Two of the giants, 77 Tau and gamma Tau, clearly exhibit emission in the high temperature ions such as N V, C IV, and Si IV at levels several times larger than the upper limits for the other two giants, delta Tau and epsilon Tau. Comparison of the Mg II h and k fluxes and the Ca II K emission strengths shows that 77 Tau and gamma Tau have larger chromospheric radiative losses than delta Tau, epsilon Tau, and beta Gem, a field giant which also displays low upper limits to emission from high temperature ions. Coronal X-ray emission indicates that the surface flux in X-rays is an order of magnitude brighter in 77 Tau than in delta Tau. The results indicate that a parameter other than age, temperature, gravity or metallicity determines the amount of chromospheric and coronal emission in late-type giants. M.G.

N81-25929*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
IUE ULTRAVIOLET OBSERVATIONS OF W UM [A] STARS
A. K. Dupree and S. Preston *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 333-340 refs (For primary document see N81-25893 16-90)
(Grants NsG-5370; NAG5-5)
Avail: NTIS HC A99/MF A01 CSCL 03B

International Ultraviolet Explorer observations of four W UMa eclipsing binary systems (44 Boo, VW Cep, W UMa, and epsilon) are discussed. The stars generally show large surface fluxes of high temperature lines (C II, C IV, N V, Si IV) which may result from the high rotational velocities forced by synchronous rotation. High dispersion spectra of the 44 Boo system in the Mg II line enable the individual stellar components to be identified. The line widths and phase variations are consistent with the optically determined spectroscopic orbit. Circumstellar absorption of Mg II may be presented at selected phases. M.G.

N81-25930*# Ohio State Univ., Columbus. Dept. of Astronomy.
NOTES ON THE EARLY-TYPE COMPONENTS OF W CEP, O CET, CH CYG, AR MON, AND BL TEL
Robert F. Wing and Kenneth G. Carpenter *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 341-347 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

Low resolution IUE spectra in both spectral regions are used to clarify the nature of the warmer components of several binary systems. The W Cep, the primary of which is a luminous K-type supergiant, shows an ultraviolet absorption spectrum of type B0 or B1; this system is heavily reddened. The hot companion of Mira (o Cet) is surprisingly faint in the short wavelength region, but it excites a rich emission spectrum from the surrounding gas. The ultraviolet active M7 giant CH Cyg is shown to be a binary with a hot companion. This system was also observed at high resolution and shows variable Fe II emission and well-separated circumstellar and interstellar absorptions within the broad Mg II emission profiles. The eclipsing binaries AR Mon and BL Tel are shown not to have hot companions. M.G.

N81-25931*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
IUE OBSERVATIONS AND INTERPRETATION OF THE SYMBIOTIC STAR RW HYA
M. Kafatos (George Mason Univ.), A. G. Michalitsianos, and R. W. Hobbs *In its* The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 349-354 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

The IUE observations of the high excitation symbiotic star RW Hya (gM2 + pec) are discussed. Analysis of the intense UV continuum observed between 1100 A to 2000 A suggests this star is a binary system in which the secondary is identified as a hot subdwarf with T sub eff being approximately 100,000 K. A distance to the system of 1000 pc is deduced. The UV spectrum consists of mainly semiforbidden and allowed transition lines of which the CIV (1548 A, 1550 A) emission lines are particularly strong, and UV continuum at both shorter and longer wavelengths. Strong forbidden lines seem to be absent suggesting the presence of a nebula of high densities. Tidal interaction between the red giant primary and the hot subdwarf is suggested as a likely means to form the observed nebula. RW Hya is suggested as a possible source of soft X-ray emission from material accreting onto the surface of the hot subdwarf. Detection of such emission with HEAO-B would give information if this accretion is taking place via Roche lobe overlow or via capture from a stellar wind emitted by the primary. A general discussion of elemental and ionic abundances in the nebula is also presented. M.G.

N81-25932*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

IUE OBSERVATIONS OF CIRCUMSTELLAR EMISSION FROM THE LATE-TYPE VARIABLE R AQR (M6 + pec)

Robert. W. Hobbs, A. G. Michalitsianos, and M. Kafatos (George Mason Univ.) *In its* The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 355-365 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

The IUE observations of R Aqr (M7 + pec) obtained in low dispersion are discussed with particular reference to circumstellar emission. Strong permitted, semiforbidden, and forbidden emission lines are seen, superimposed on a bright ultraviolet continuum. It is deduced that the strong emission line spectrum that involves C III, C IV, Si III, (O II) and (O III) probably arises from a dense compact nebula the size of which is comparable to the orbital radius of the binary system of which R Aqr is the primary star. The low excitation emission lines of Fe II, Mg II, O I, and Si II probably a white dwarf, comparable to or somewhat brighter than the Sun, since such a star can produce enough ionizing photons to excite the continuum and emission line spectrum and yet be sufficiently faint as to escape detection by direct observation. The UV continuum is attributed to Balmer recombination from the dense nebula and not to blackbody emission from the hot companion. M.G.

N81-25933*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

IUE OBSERVATIONS OF TWO LATE-TYPE STARS BX MON (M + pec) AND TV GEM (M1 Iab)

A. G. Michalitsianos, R. W. Hobbs, and M. Kafatos (George Mason Univ.) *In its* The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 367-375 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

The IUE observations of two late type stars BX Mon and TV Gem that reveal the emission properties in the ultraviolet of subluminous companions are discussed. Analysis of the continuum emission observed from BX Mon suggests the companion, is a middle A III star. High excitation emission lines observed between 1200 A and 2000 A that generally do not typify emission observed in either late M type variables or A type stars are also detected. It is suggested that these strong high excitation lines arise in a large volume of gas heated by nonradiation processes that could be the result of tidal interaction and mass exchange in the binary system. In contrast to stars such as BX Mon, the luminous M1 supergiant TV Gem shows unexpected intense UV continuum throughout the sensitivity range of IUE. The UV spectrum of TV Gem is characterized by intense continuum with broad absorption features detected in the short wavelength range. The analysis shows that the companion could be a B9 or A1 III-IV star. Alternate suggestions are presented for explaining the UV continuum in terms of an accretion disk in association with TV Gem. M.G.

N81-25934*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE 1979 ECLIPSE OF ZETA AURIGAE

Robert D. Chapman *In its* The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 377-380 (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

Observations of the system zeta Aurigae made around primary eclipse are described, and their significance is discussed in a preliminary fashion. Author

N81-25935*# Biruni Observatory, Shiraz (Iran).

VISIBLE-BAND AND IUE OBSERVATIONS OF MU SAGITTARII

J. D. Dorren, E. F. Guinan, and E. M. Sion *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 381-388 refs Prepared in cooperation with Villanova Univ., Pa. (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

H alpha and U band photometry and IUE spectra of the binary system mu Sagittarii are discussed. An estimate of mass-loss is made from the observed P Cygni profiles. There are indications of pulsation in the supergiant B8 component. Author

N81-25936*# California Univ., Los Angeles. Dept. of Astronomy.

THE IMPACT OF IUE ON BINARY STAR STUDIES

Mirek J. Plavec *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 397-413 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

The use of IUE observations in the investigation of binary stars is discussed. The results of data analysis of several classes of binary systems are briefly reviewed including zeta Aurigae and VV Cephei stars, mu Sagittarii, epsilon Aurigae, beta Lyrae and the W Serpentis stars, symbiotic stars, and the Algols. M.G.

N81-25937*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

HIGHLY-EVOLVED STARS

Sara R. Heap *In its* The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 415-434 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

The ways in which the IUE has proved useful in studying highly evolved stars are reviewed. The importance of high dispersion spectra for abundance analyses of the sdO stars and for studies of the wind from the central star of NGC 6543 and the wind from the O type component of Vela X-1 is shown. Low dispersion spectra are used for absolute spectrophotometry of the dwarf nova, Ex Hya. Angular resolution is important for detecting and locating UV sources in globular clusters. E.D.K.

N81-25938*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.

IUE SPECTRA OF A FLARE IN HR 5110: A FLARING RS CVn OR ALGOL SYSTEM?

Theodore Simon, Jeffrey L. Linsky, and Francis H. Schiffer, III (Computer Sciences Corp.) *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 435-441 refs (For primary document see N81-25893 16-90)
(Contract NAS5-23274; Grant NGL-06-003-057)
Avail: NTIS HC A99/MF A01 CSCL 03B

Ultraviolet spectra of the RS CVn type binary system HR 5110 were obtained with IUE on May 31, 1979 during a period of intense radio flaring of this star. High temperature transition region lines are present, but are not enhanced above observed quiescent strengths. The similarities of HR 5110 to the Algol system, As Eri, suggest that the 1979 May to June flare may involve mass exchange rather than annihilation of coronal magnetic fields. Author

N81-25939*# California Univ., Los Angeles. Dept. of Astronomy.

ANALYSIS OF THE SYMBIOTIC STAR AG PEGASI

Charles D. Keyes and Mirek J. Plavec *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 443-450 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

High and low dispersion IUE data are analyzed in conjunction with coincident ground based spectrophotometric scans and supplementary infrared photometry of the symbiotic object AG Pegasi. The IUE observations yield an improved value of E(B-V) = 0.12. The two stellar components are easily recognized in the spectra. The cool component may be an M1.7 III star and the hot component appears to have T (sub eff) of approximately 30000 K. The emission lines observed in the ultraviolet indicate two or three distince emitting regions. Nebular component ultraviolet intercombination lines suggest an electron density of several times 10 billion/cu cm. Author

N81-25940*# Instituto de Astronomia y Fisica del Espacio, Buenos Aires (Argentina).

IUE OBSERVATIONS OF SYMBIOTIC STARS

Jorge Sahade and Estela Brandi (Observatorio Astronomico) *In* NASA. Goddard Space Flight Center The Universe of Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 451-454 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

The IUE observations suggest that the symbiotic stars can be placed in two broad groups. One of the groups is characterized by strong, narrow emissions arising from a wide range of excitation energies, while the other one typically shows a strong continuum with absorption lines and very few or no emissions at all. Both broad groups appear to suggest that these are binary systems and that they probably differ in the characteristics and extent of the chromosphere-corona formation that is present in the system. E.D.K.

N81-25941*# Washington State Univ., Pullman.
THE WHITE DWARF COMPANION OF THE B A 2 STAR ZETA CAP
Erika Boehm-Vitense *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 455-458 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

The Ba II star zeta Cap has a white dwarf companion. Its T (sub eff) is determined to be 22000 K, its mass is approximately one solar mass. The importance of this finding for the explanation of abundance peculiarities is discussed. E.D.K.

N81-25942*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INGRESS OBSERVATIONS OF THE 1980 ECLIPSE OF THE SYMBIOTIC STAR CI CYNGNI
Robert E. Stencel (Joint Institute for Lab. Astrophysics), Andrew G. Michalitsianos, Minas Kafatos (George Mason Univ.), and Alexander A. Boyarchuk (Crimean Astrophysical Observatory) *In its* The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 459-460 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

One of the major results from the IUE may prove to be the knowledge gained by studies of the ultraviolet spectra of symbiotic stars. Symbiotics combine spectral features of a cool M giant like photosphere with strong high excitation emission lines of nebular origin, superposed. The UV spectra are dominated by intense permitted and semiforbidden emission lines and weak continua indicative of hot compact objects and accretion disks. Two symbiotics, AR Pav and CI Cyg are thought to be eclipsing binaries and IUE observations during the 1980 eclipse of CI Cygni are discussed. E.D.K.

N81-25943*# Texas Univ. at Austin.
ULTRAVIOLET SPECTROSCOPY OF OLD NOVAE AND SYMBIOTIC STARS
David L. Lambert, Mark H. Slovak, Gregory A. Shields, and Gary J. Ferland (Cambridge Univ.) *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 461-467 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

The IUE spectra are presented for two old novae and for two of the symbiotic variables. Prominent emission line spectra are revealed as a continuum whose appearance is effected by the system inclination. These data provide evidence for hot companions in the symbiotic stars, making plausible the binary model for these peculiar stars. Recent IUE spectra of dwarf novae provide additional support for the existence of optically thick accretion disks in active binary systems. The ultraviolet data of the eclipsing dwarf novae EX Hya and BV Cen appear flatter than for the noneclipsing systems, an effect which could be ascribed to the system inclination. E.D.K.

N81-25944*# Villanova Univ., Pa.
ON THE NATURE OF THE NOVA-LIKE VARIABLE CD-42 DEG 14462
E. F. Guinan and E. M. Sion *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelenghts: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 471-475 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

Low dispersion long and short wavelength IUE spectra of the nova like system CD-42 deg 14462 were obtained on August 24 U.T. The short wave spectrum exhibits absorption features due to C III (lambda 1175), Lalpha 1216), NV (lambda1240), HeII (lambda 1640), SiIV (lambda1394), NIV (lambda1875) with CIV (lambda1550) as a P Cygni feature with blue shifted absorption suggesting the presence of material leaving the system. Possible interpretations of this object are discussed. Author

N81-25945*# Villanova Univ., Pa.
ORBITAL PHASE DEPENDENT IUE SPECTRA OF THE NOVA LIKE BINARY II ARIETIS
E. F. Guinan and E. M. Sion *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelength: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 477-484 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

Nine low dispersion IUE spectra of the nova like binary TT Ari over its 3h17m orbital period were obtained. Four short wave spectra and five long wave spectra exhibit marked changes in line strength and continuum shape with orbital phase. The short wave spectra show the presence in absorption of C III, Lyman alpha, SiIII, NV, SiIV, CIV, HeII, AlIII, and NIV. The CIV shows a P Cygni profile on two of the spectra. Implications of these spectra for the nature of nova like variables are discussed. E.D.K.

N81-25946*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SEARCH FOR COLLIDING STELLAR WINDS IN PLASKETT'S STAR (HD 47129)
Sara R. Heap *In its* The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 485-493 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

High dispersion spectra of Plaskett's star (HD 47129) were obtained with the short wavelength spectrograph on IUE at five phases of the binary cycle. The unsaturated wind profiles, particularly those of Si IV lambda 1400, show complex phase dependent structure. Two interpretations for the structure are suggested, neither of which is entirely satisfactory: (1) the structure is a consequence of directed streams, and (2) the structure is a consequence of colliding winds from the primary and secondary. E.D.K.

N81-25947*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
OBSERVATIONS OF CATACLYSMIC VARIABLES WITH IUE
L. Hartmann and J. Raymond *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 495-500 refs (For primary document see N81-25893 16-90)
(Grants NsG-5370; NAG5-5)
Avail: NTIS HC A99/MF A01 CSCL 03B

Observations are reported of the cataclysmic variables AN UMa, 2A0311-227, VV Pup, DQ Her, and GK Per. Continuum emission was detected in the short wavelength region in DQ Her. This object exhibits a quasi-blackbody spectrum at short wavelengths, such blackbody components are a common property of the variables AM Her, SS Cyg, and U Gem, suggesting an underlying similarity in the activity of these diverse systems. Flat continuum components at longer wavelengths in general are not compatible with standard disk models. The emission line ratios in AE Aqr are anomalous in that C IV is absent to a very low level relative to N V. E.D.K.

N81-25948*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
COORDINATED IUE, EINSTEIN AND OPTICAL OBSERVATIONS OF ACCRETING DEGENERATE DWARFS
B. Fabbiano, J. E. Steiner (Sao Paulo Univ.), L. Hartmann, and J. Raymond *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 501-514 refs (For primary document see N81-25893 16-90)
(Contracts NAS8-30751; NAS8-30453; Grants NAG5-5; NsG-5370)
Avail: NTIS HC A99/MF A01 CSCL 03B

Three binary systems believed to be composed of a white dwarf and a late type star, AM Her, SS Cyg, and U Gem were observed simultaneously in the IV X-ray and optical wavelengths.

The system AM Her was in its customary high state at the time of the observations, while SS Cyg and U Gem were in a low state. In all three cases, a significant UV black body component with KT approximately greater than 10 eV was found. The flux in this component is in excess of the amount predicted by current scenarios of gravitational energy release. E.D.K.

N81-25949*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
CYCLOTRON EMISSION FROM AM HERCULIS
G. Chanmugam *In* NASA. Goddard Space Flight Center The Universe of Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 515-519 refs (For primary document see N81-25893 16-90)
(Grant NSF MST-76-06807)
Avail: NTIS HC A99/MF A01 CSCL 03B

The cyclotron absorption coefficients in the ordinary and extraordinary modes are calculated for the shock heated region of AM Her. The equations of radiative transfer are solved and the intensity of the emitted UV radiation determined as a function of angle. The average spectrum is shown to have deviations from the previously predicted Rayleigh-Jeans spectrum and the magnetic field of AM Her is deduced to be roughly 5 x 10 to the 7th power gauss. Author

N81-25950*# Consiglio Nazionale delle Ricerche, Bologna (Italy). Ist. di Radioatronomia.
OBSERVATIONS OF SUPERNOVA 1979c IN M 100
Nino Panagia *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 521-525 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

The IUE observations of supernova 1979c in M 100 are presented and discussed. The main results are: (1) the bulk of the energy is in the form of continuous emission which is radiated by the main SN envelope; (2) the absorption features originate mostly in both the disks and the haloes of our Galaxy and M 100; and (3) the emission lines are produced in a highly ionized shell which has a radius greater than twice the radius of the main envelope and consists of compressed circumstellar material in which the abundance ratio N/C is about 30 times higher than solar. Author

N81-25951*# Wisconsin Univ. - Madison. Washburn Observatory.
HORIZONTAL BRANCH STARS, AND GALACTIC AND MAGELLANIC CLOUD GLOBULAR CLUSTERS
Klaas S. deBoer *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 17 Jun. 1981 p 527-531 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

Seven blue horizontal branch stars in the field were observed and a few HB stars were isolated in globular clusters. Energy distributions are compared to assess possible differences and also used in comparison with model atmospheres. Observed energy distributions of HB stars in NGC 6397 are used to estimate the total number of HB stars which produced the integrated fluxes as observed by ANS. Preliminary results are given for colors of globular clusters observed in the Magellanic Clouds and for their extent, based on the Washburn IUE extraction. Author

N81-25952*# Princeton Univ. Observatory, N. J.
OBSERVATIONS OF THE INTERSTELLAR MEDIUM WITH IUE
Edward B. Jenkins *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 541-556 refs (For primary document see N81-25893 16-90)
(Grant NsG-5248)
Avail: NTIS HC A99/MF A01 CSCL 03B

Limitations of the International Ultraviolet Explorer (IUE) are discussed, as well as improved powers of research in these areas: (1) Si and C IV doublet absorptions in the high dispersion stellar spectra of distant stars; (2) observation of spectra outside the galactic plans; (3) high velocity gas. S.F.

N81-25953*# Universidad Nacional Autonoma de Mexico, Villa Obregon. Inst. de Astronomia.
NEW INSIGHTS INTO THE PHYSICAL STATE OF GASEOUS NEBULAE
Manuel Peimbert *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 557-565 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

The impact of knowledge of H II regions, planetary nebulae and supernova remnants due to International Ultraviolet Explorer is examined. The more relevant aspects related to the physical conditions of gaseous nebulae are reviewed. The following properties of gaseous nebulae are discussed: (1) density and temperature distribution; (2) ionization structure; (3) chemical composition; (4) internal dust; and (5) shock velocity for supernova remnants. The CNO abundances of planetary nebulae are compared with stellar evolution models. S.F.

N81-25954*# Colorado Univ. at Boulder. Lab. for Atmospheric and Space Physics.
INTERSTELLAR ABUNDANCE DETERMINATION USING IUE DATA
Charles L. Joseph and Theodore P. Snow, Jr. *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 567-569 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

Analysis of the silicon interstellar abundances was made for more heavily reddened lines of sight than were accessible to the Copernicus satellite. Silicon rarely had accurate column densities determined from Copernicus data because the available lines all lie on the flat portion of the curve of growth. With International Ultraviolet Explorer (IUE) it is possible to reach color excesses of E(B-V) approximately 0.5-0.7, and in addition obtain data on the weak SiII line at 1808 A, so that a wide range of oscillator strengths is available. The lower resolving power of the IUE causes difficulties in that several of the SiII lines are blended with strong lines of other species. Data on the lines of sight analyzed suggested that some of the absorption lines fall on the damped portion of the curve of growth, implying that silicon may not be as highly depleted as expected. S.F.

N81-25955*# Herzberg Inst. of Astrophysics, Pentiction (British Columbia). Dominion Astrophysical Observatory.
COMPARISONS BETWEEN OPTICAL AND ULTRAVIOLET INTERSTELLAR LINES FORMED IN THE CARINA NEBULA (NGC 3372)
James E. Hesser and Nolan R. Walborn (Cerro Tololo Inter-American Observatory) *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 571-579 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

Discovery of complex Ca II H and K interstellar line profiles towards stars embedded in the giant H II region surrounding Eta Carinae led to a reconnaissance of the richer ultraviolet (UV) interstellar line spectrum. Single International Ultraviolet Explorer (IUE) spectra were secured for those stars exhibiting the greatest variety of structure in the optical interstellar lines, namely, HD 93130, 93160, 93162, 93204, 93205, 93206 and HDE 303308. Appraisal of the spectra suggests that: (1) longwards of Lyman Alpha many of the interstellar lines, including an unidentified one, in the spectrum of Zeta Oph seem to be present in the Carina Nebula spectra; (2) interstellar line structure varies widely in both velocity and intensity throughout the region, as well as along a given line of sight as the species change; (3) new high velocity components of UV lines appear to extend the total range of velocities in the nebular interstellar lines to about 400 m/s; and (4) lines of the high excitation species Si IV and C IV are strong and also structured in velocity space. S.F.

N81-25956*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A SEARCH FOR INTERSTELLAR MOLECULES IN THE SPECTRA OF HIGHLY REDDENED STARS
D. Lien (Illinois Univ., Urbana), D. Buhl, R. M. Crutcher (Illinois

Univ., Urbana), B. Donn, A. M. Smith, L. E. Snyder (Illinois Univ., Urbana), and L. J. Stief *In its* The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 581-588 refs (For primary document see N81-25893 16-90)
(Grant NsG-5278)
Avail: NTIS HC A99/MF A01 CSCL 03B

A total of ten stars were observed with cameras of the International Ultraviolet Explorer (IUE) in both high and low dispersion. One star, X Persei (HD 24534, 6.0 BE), was analyzed in detail. Ultraviolet observations of the column densities of CO match those derived from the radio to within a factor of 4, with the difference probably due to the larger beam size of the radio measurement and the assumption of a thermal population in the rotational levels of CO. Upper limits are given to the log column densities for OH, HCl, and CH2 of 14.0, 12.3 and 12.8. The carbon abundance was found to be about solar with a possible depletion of about a factor of 2. With precautions concerning both noise and correct background, the IUE can be used for studies of interstellar molecules. S.F.

N81-25957*# Princeton Univ. Observatory, N. J.
A COMPRESSED CLOUD IN THE VELA SUPERNOVA REMNANT
Edward B. Jenkins, George Wallerstein (Washington Univ., Seattle), E. Myccky Leep (Washington Univ., Seattle), and Joseph Silk (California Univ., Berkeley) *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 589-594 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

To elucidate the nature of the interstellar medium in the vicinity of the Vela supernova remnants (SNR) an extensive study with the International Ultraviolet Explorer of interstellar absorption lines toward 35 stars in the vicinity of the Vela SNR was undertaken. Observations of interstellar absorption, in particular of CI, towards one of these stars, HD 72350 (type B4 III), is of particular interest. S.F.

N81-25958*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
IUE OBSERVATIONS OF SUPERNOVA REMNANTS
J. Raymond *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 595-599 refs (For primary document see N81-25893 16-90)
(Contract NAG5-5; Grant NsG-5370)
Avail: NTIS HC A99/MF A01 CSCL 03B

The ultraviolet emission spectra of several filaments in the Cygnus Loop and the Vela Supernova Remnant, including several which are anomalously bright in the optical lines, are discussed. The effects of internal and interstellar resonance line scattering are estimated. Shock velocities, elemental abundances, and in some cases, filament ages are given. Author

N81-25959*# Computer Sciences Corp., Albuquerque, N. Mex. Astronomy Dept.
SURFACE MAPPING OF SELECTED REGIONS IN THE ORION NEBULA
P. M. Perry, B. E. Turnrose, C. A. Harvel, R. W. Thompson, and A. D. Mallama *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 601-610 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

Low dispersion, large aperture, ultraviolet spectra of selected regions in the Orion Nebula were obtained with the International Ultraviolet Explorer (IUE) scientific instrument. Spectra obtained at 35 contiguous locations defining a mosaic within the nebula were used to generate monochromatic images of high spatial resolution at the wavelengths of the ultraviolet emission lines. Image processing techniques were utilized to generate and analyze these ultraviolet surface maps. The imagery at the three wavelengths studied shows definite differences in the spatial distribution of emission from the CII CIII and OII ions. Ways of using the imagery to determine ionization structure and C/O abundance ratios throughout the regions observed are developed, in addition to means of analyzing the extensive continuum measurements in terms of dust scattering characteristics. Author

N81-25960*# Wisconsin Univ. - Madison.
ULTRAVIOLET ABSORPTION BY INTERSTELLAR GAS AT LARGE DISTANCES FROM THE GALACTIC PLANE
Blair D. Savage and Klaas S. deBoer *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 611-612 (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

Eighteen high dispersion International Ultraviolet Exploration spectra of 6 stars in the large magellanic cloud (LMC) 3 stars in the small magellanic cloud (SMC) and 2 foreground stars were studied. Fourteen spectra cover the wavelengths lambda 1150-2000 A and 4 cover lambda 1900-3200 A. All the Magellanic Cloud star spectra exhibit exceedingly strong interstellar absorption lines due to a wide range of ionization stages at galactic velocities and at velocities associated with the LMC or SMC. The analysis is restricted to the Milky Way absorption features. Toward the LMC stars, the strong interstellar lines have a positive velocity extension, which exceeds the extension recorded toward the SMC stars. The most straightforward interpretation of these velocity extensions is obtained by assuming that gas at large distances away from the plane of the galaxy participates in the rotation of the galaxy as found in the galactic disk. S.F.

N81-25961*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ELECTRON DENSITIES FOR SIX PLANETARY NEBULAE AND HM SGE DERIVED FROM THE C 3 LAMBDA 1907/1909 RATIO
In its The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 613-621 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

Electron densities for IC 418, NGC 6572, IC 1297, NGC 3242, NGC 6818, NGC 3211, and HM Sge derived from high dispersion IUE C III spectrograms are consistently higher than those derived from either surface brightness measurements of forbidden line intensity ratios in the visible. The nebulae were selected for a range of excitation classes from 3 to 9. Line splitting due to expansion velocities is observed for three objects. The great width of the lambda 1909 C III line in HM Sge suggests large expansion velocities. Author

N81-25962*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SILICON AND MAGNESIUM IN PLANETARY NEBULAE
J. P. Harrington (Maryland Univ., College Park) and P. A. Marionni *In its* The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 623-631 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

The IUE satellite spectra of some planetary nebulae show features due to silicon and magnesium: Si III wavelengths 1883, 1892; Si IV wavelengths 1394, 1403; Mg II wavelengths 2796, 2804 and Mg V wavelengths 2784, 2929. With the aid of modeling techniques, the corresponding elemental abundances are found. In addition to previous observations of NGC 7662 and IC 418, data were found for NGC 2440, Hu 1-2, IC 2003 and IC 2165. Silicon appears depleted by up to an order of magnitude relative to the sun. Large variations of magnesium abundance are found, which are likely to reflect differing degrees of depletion due to grain formation. S.F.

N81-25963*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ELEMENTAL ABUNDANCES IN HIGH-EXCITATION PLANETARY NEBULAE
P. A. Marionni and J. P. Harrington (Maryland Univ., College Park) *In its* The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 633-639 refs (For primary document see N81-25893 16-90)
Avail: NTIS HC A99/MF A01 CSCL 03B

The IUE satellite was used to obtain low dispersion spectra of the high excitation planetary nebulae IC 351, IC 2003, NGC 2022, IC 2165, NGC 2440, Hu 1-2, and IC 5217. Numerical

modeling was undertaken to determine the chemical composition of these objects with particular emphasis on obtaining elemental carbon and nitrogen abundances. Large variations in the C/N ratio from object to object are suggested. Author

N81-25964*# Universidad Nacional Autonoma de Mexico, Villa Obregon. Inst. de Astronomica.

THE HIGH-EXCITATION PLANETARY NEBULAE: NGC 3918 AND IC 2448

S. Torres-Peimbert, M. Pena, and E. Daltabuit *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 641-647 refs (For primary document see N81-25893 16-90)

Avail: NTIS HC A99/MF A01 CSCL 03B

International Ultraviolet Exploration observations of NGC 3918 and IC 2448 are presented. Combining these observations with data in the optical range and computed model structure, the chemical composition for these objects is derived. For NGC 3918 log C = -3.02, log N = -3.61 and log O = -3.22; while for IC 2448 log C = -3.44, log N = -81 and log O = 3.54. Author

N81-25965*# California Univ., Los Angeles. Dept. of Astronomy.

ANALYSIS OF HIGH EXCITATION PLANETARY NEBULAE

L. H. Aller and C. D. Keyes *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 649-656 refs (For primary document see N81-25893 16-90)

Avail: NTIS HC A99/MF A01 CSCL 03B

Combination of extensive ground-based spectroscopic observation of high excitation planetary with IUE data permit determination not only of improved diagnostics but also better abundances for elements such as C and N that are well represented in the ultraviolet spectra and also C, Ar and metals Na, Ca and K whose lines appear in the wavelength 3200-8100 A region. S.F.

N81-25966*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

DISCOVERY OF THE MOLECULAR HYDROGEN ION (H2(+)) IN THE PLANETARY NEBULAE

Sara R. Heap and Theodore P. Stecher *In its* The Universe at Ultraviolet Wavelengths: The First Two Yrs. of the Intern. Ultraviolet Explorer 1981 p 657-661 refs (For primary document see N81-25893 16-90)

Avail: NTIS HC A99/MF A01 CSCL 03B

Low-dispersion spectra of fifteen planetaries and hot subdwarfs were obtained with the short wavelength prime camera on IUE and continuous flux distributions corrected for interstellar extinction were derived. Several planetaries, particularly the young planetaries of high surface brightness, show anomalous flux distributions. The most anomalous case is NGC 6210. These anomalies may be explained as absorption by H2+ H2(+) in the nebula. S.F.

N81-25967*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

AN ATLAS OF EMISSION LINE FLUXES OF PLANETARY NEBULAE IN THE 1150-3200 A REGION

W. A. Feibelman and C. W. McCracken *In its* The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 663-669 refs (For primary document see N81-25893 16-90)

Avail: NTIS HC A99/MF A01 CSCL 03B

Emission line fluxes for 28 planetary nebulae are presented. The nebulae were chosen to cover a wide range of excitation classes, apparent diameters, location in the sky, and types of central stars. All objects were observed in the low dispersion mode of the IUE spectrographs, using the large entrance aperture. S.F.

N81-25968*# Rice Univ., Houston, Tex.

THE CARBON ABUNDANCE IN TWO H 2 REGIONS OF THE SMALL MEGALLANIC CLOUD

Reginald J. Dufour, Raymond J. Talbot, Jr., and Gregory A. Shields (Texas Univ. at Austin) *In* NASA Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 671-678 refs (For primary document see N81-25893 16-90)

Avail: NTIS HC A99/MF A01 CSCL 03B

Observations of the ultraviolet spectra of two locations in the H II region NGC 346 and of the entire H II region IC 1644 in the Small Magellanic Cloud (SMC) were made using the International Ultraviolet Explorer (IUE) satellite. The abundance of carbon in the nebulae was derived using theoretical model analysis combined with ground-based spectrophotometry of other emission lines. The abundance of C relative to H in the SMC was found to be lower by -0.9 dex compared with the Sun and lower by -0.8 dex compared with the Orion Nebula. This C deficiency is similar to that of O, Ne, S, and Ar in the SMC, but not as great as found for N. The sites and history of C nucleosynthesis in galaxies is similar to that of O, Ne, S, and Ar, in contrast to that of N, which appears to be more complex, perhaps because of a mixture of secondary primary sources or a significant contribution from intermediate-mass long-lived stars. S.F.

N81-25969*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SUPERBUBBLES

Theodore R. Gull, Frederick C. Bruweiler (Computer Sciences Corp.), Minas Kafatos (George Mason Univ.), and Sabatino Sofia *In its* The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 679-685 refs (For primary document see N81-25893 16-90)

Avail: NTIS HC A99/MF A01 CSCL 03B

Individual massive stars with M sub bol < -6 have huge stellar winds that create interstellar bubbles. Stars with masses greater than 8 solar mass are considered supernova progenitors. These massive stars are numerous in OB associations where few supernova remnants are detected. Model calculations describing the evolution of an association show: that large, hot cavities are formed by pushing the ambient gas into neutral shells; that the shell radii change with galactocentric radius; that only thirty percent of the interstellar medium is in the form of supercavities; and that a consequence is that only a small fraction of supernovae form supernova remnants. T.M.

N81-25970*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE YOUNG OF STAR HD148937 AND ITS ASSOCIATED INTERSTELLAR BUBBLE: H 2 REGION

Frederick C. Brwhweiler (Computer Sciences Corp.) and Theodore R. Gull *In its* The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 687-691 refs (For primary document see N81-25893 16-90)

Avail: NTIS HC A99/MF A01 CSCL 03B

The star HD148937 and nebulosities surrounding the star are found to be closely inter-related. IUE spectroscopy of HD148937 shows the star to be a young Of star with low mass loss. Properties Of the surrounding interstellar bubble and the H II region support the implied youth of HD148937. T.M.

N81-25971*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

PRELIMINARY REPORT ON IUE SPECTRA OF THE CRAB NEBULA

K. Davidson (Minnesota Univ.), T. R. Gull, S. P. Maran, T. P. Stecher, M. Kafatos (Geoge Mason Univ.), and V. L. Trimble (California Univ., Irvine) *In its* The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 696-700 refs (For primary document see N81-25893 16-90)

Avail: NTIS HC A99/MF A01 CSCL 03B

The Crab Nebula is marginally observable with the IUE. Observations of the optically brightest filamentary regions, made with IUE in August 1979, show the C IV lambda 1549, He II lambda 1640, and C III lambda 1909 emission lines. The intensities of these lines were compared with the visual wavelength data. It appears that carbon is not overabundant in the Crab; carbon/oxygen is approximately normal and oxygen is slightly scarcer than normal as a fraction of the total mass. T.M.

N81-25972*# Arizona Univ., Tucson.

NEW INSIGHT INTO THE PHYSICAL STATE OF GALAXIES

AND QUASARS

Richard F. Green *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 711-723 refs (For primary document see N81-25893 16-90)

Avail: NTIS HC A99/MF A01 CSCL 03B

Data from the International Ultraviolet Explorer satellite have revolutionized many concepts in extragalactic astronomy. These include the physical processes at work in the emitting gas characteristic of active objects, the nature of the continuum source itself in those objects, and the constituent hot stellar and gaseous components of normal galaxies. Several problems of extragalactic research investigated with IUE were reviewed. T.M.

N81-25973*# Consiglio Nazionale delle Ricerche, Bologna (Italy). Ist. di Radioastronomica.

OBSERVATIONS OF THE NUCLEUS OF M100

N. Panagia, G. Vettolani, G. G. C. Palumbo, P. Benvenuti (ESA, Madrid), and F. Macchetto (ESA, Noordwijk, Netherlands) *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 725-728 refs (For primary document see N81-25893 16-90)

Avail: NTIS HC A99/MF A01 CSCL 03B

The galaxy M100 = NGC 4321 is a spiral galaxy in which a bright Type II Supernova was discovered on April 19, 1979. Its spectral evolution was followed with IUE for more than two months (refs. 1,2). At all epochs, the spectrum was dominated by continuous radiation on which emission and absorption features were superimposed. The equivalent width of most of the absorption features appeared not to vary with time suggesting that they originated in the interstellar media of M100 and our own galaxy. T.M.

N81-25974*# California Univ., Berkeley. Dept. of Astronomy.

THE ULTRAVIOLET SPECTRA OF EARLY TYPE GALAXIES

A. G. Bruzual and H. Spinrad *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 731-736 refs (For primary document see N81-25893 16-90)

Avail: NTIS HC A99/MF A01 CSCL 03B

The average spectral energy distribution for a sample of bright elliptical galaxies is presented in the range lambda lambda 2000 to 3200 A. Spectral synthesis indicates that elliptical galaxies are most likely older than 9 Gyrs. The ultraviolet flux is consistent with a population of red horizontal branch stars, as those present in metal rich globular clusters. Data for distant first ranked cluster galaxies show indications of spectral evolution. T.M.

N81-25975*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

IUE OBSERVATIONS OF SEYFERT GALAXIES

Chi-Chao Wu (Computer Sciences Corp.), A. Boggess, and T. R. Gull *In its* The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 737-742 refs (For primary document see N81-25893 16-90)

(Contract NAS5-25774)

Avail: NTIS HC A99/MF A01 CSCL 03B

The L alpha/H beta ratio and line profiles for several galaxies are presented. The continuous energy distribution of NGC 4151 and MKN 509 are presented from the X-ray region to the infrared. T.M.

N81-25976*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.

THE UV VARIABILITY OF THE SEYFERT 1: GALAXIES 3 Zw 2 AND MARKARIAN 509

John Huchra, Margaret Geller, and Donald Merton (Anglo-Australian Observatory) *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 743-749 refs (For primary document see N81-25893 16-90)

Avail: NTIS HC A99/MF A01 CSCL 03B

The two galaxies differ markedly in their radio properties. III Zw 2 is a strong source with a highly variable compact component while MK 509 is a very weak source. Both galaxies show significant variations in X-rays and MK 509 has shown variations at optical wavelengths as well. Simultaneous observations were made in the ultraviolet, optical and infrared in order to examine three fundamental aspects of the origin of the continuum emission: are these thermal and nonthermal components; how large is the emitting region; and does the UV flux originate in the same region responsible for the optical, IR, radio and/or X-ray continuum emission? T.M.

N81-25977*# New York Univ., N. Y.

SIMULTANEOUS OBSERVATIONS OF ACTIVE GALACTIC NUCLEI WITH IUE

J. N. Bregman, A. E. Glassgold, and P. J. Huggins *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 751-755 refs (For primary document see N81-25893 16-90)

Avail: NTIS HC A99/MF A01 CSCL 03B

The IUE observations of four active nuclei were coordinated with radio, infrared, and X-ray measurements to obtain simultaneous determinations of their continuous spectra. The results for the BL Lac objects 0735+178 and I Zw 187 indicate sufficient UV and X-ray fluxes to ionize any gas. Comparison of the X-ray measurements with the extrapolated optical UV continuum show a definite X-ray excess for I Zw 187 but none for the other BL Lac object. T.M.

N81-25978*# European Space Technology Center, Noordwijk (Netherlands). Astronomy Div.

IUE OBSERVATIONS OF Fe 2 GALAXIES

M. V. Penston, M. A. J. Snijders (University Coll., London), A. Boksenberg (University Coll., London), J. D. J. Haskell (University Coll., London), and R. A. E. Fosbury (Royal Greenwich Observatory, Hailsham, England) *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 757-766 (For primary document see N81-25893 16-90)

Avail: NTIS HC A99/MF A01 CSCL 03B

Repeated observations of the Seyfert 1 galaxies I Zw 1 and II Zw 136, which have very strong Fe II emission lines in the optical region, were made at low resolution with the IUE Satellite. The ultraviolet spectra are very similar: both are variable and show broad emission features of Fe II (especially the UV multiplets 1, 33, 60, 62, and 63) as well as the emission lines usually strong in Seyferts and quasars. The data strongly support the hypothesis that the optical Fe II emission lines are primarily due to collisional excitation and that resonance fluorescence makes only a minor contribution to the excitation of these lines. T.M.

N81-25979*# Wisconsin Univ. - Madison.

WASHBURN EXTRACTION AND WIDTH OF THE IUE POINT SPREAD FUNCTION

Klass S. deBoer, Jan Koorneef (European Southern Observatory, Santiago, Chile), and Marilyn R. Meade *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 771-775 refs (For primary document see N81-25893 16-90)

Avail: NTIS HC A99/MF A01 CSCL 03B

The Washburn Extraction Routine for low dispersion IUE spectra was reviewed. The shape of the point spread function (PSF) in low dispersion spectra is sufficiently well described by a Gaussian function. The PSF is in large and small aperture essentially identical and values of sigma are presented. Several advantages of the extraction routine are mentioned. T.M.

N81-25980*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

RESULTS OF BASIC IMPROVEMENTS TO THE EXTRACTION OF SPECTRA FROM IUE IMAGES

Don J. Lindler (Andrulis Research Corp.) and Ralph C. Bohlin *In its* The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 777-785 refs (For primary document see N81-25893 16-90)

Avail: NTIS HC A99/MF A01 CSCL 03B

Results of two methods of extracting spectra from IUE images are compared. The first method, which is presently implemented, performs a geometric correction of the image followed by a photometric correction. The spectral data are then extracted using a slit with an effective width and sampling interval of 2.4A for

the SWP camera and 3.7A for the LWR camera in low dispersion. The second method performs the photometric correction without doing a geometric correction. The spectral data are then extracted from the photometrically corrected image by an extraction slit, which follows the spectral orders in the nongeometrically corrected space, with an effective width and sampling interval 1/2 that of the present method. T.M.

N81-25981*# Johns Hopkins Univ., Baltimore, Md. Dept. of Physics.

EXTRACTING SPATIAL INFORMATION FROM LARGE APERTURE EXPOSURES OF DIFFUSE SOURCES

J. T. Clarke and H. W. Moos *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 787-793 refs (For primary document see N81-25893 16-90)

Avail: NTIS HC A99/MF A01 CSCL 03B

The spatial properties of large aperture exposures of diffuse emission can be used both to investigate spatial variations in the emission and to filter out camera noise in exposures of weak emission sources. Spatial imaging can be accomplished both parallel and perpendicular to dispersion with a resolution of 5-6 arc sec, and a narrow median filter running perpendicular to dispersion across a diffuse image selectively filters out point source features, such as reseaux marks and fast particle hits. Spatial information derived from observations of solar system objects is presented. T.M.

N81-25982*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

IMPROVEMENTS TO THE ACCURACY OF THE IUE WAVELENGTH SCALES IN HIGH DISPERSION

Barry E. Turnrose (Computer Sciences Corp.), Christopher A. Harvel (Computer Sciences Corp.), and Ralph C. Bohlin *In its* The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 795-800 refs (For primary document see N81-25893 16-90)

(Contract NAS5-24350)

Avail: NTIS HC A99/MF A01 CSCL 03B

The data base of Pt-Ne emission lines used to calibrate the IUE high dispersion wavelength scales was scrutinized to improve the internal consistency of the adopted laboratory wavelength values and provide a homogeneous, documented line list, which IUE Guest Observers may use to evaluate quantitatively those Pt-Ne spectra taken to calibrate their data. After deletion of incorrect or inappropriate data in the old data base (lines with incorrect wavelength assignments; lines which are too faint, too bright, or blended; lines which fall near reseau marks, etc.) and the addition of several new entries, a total of 172 Pt-Ne lines for the SWP camera and 164 Pt-Ne lines for the LWR camera are now used for routine wavelength calibration in the high dispersion mode. T.M.

N81-25983*# Colorado Univ. at Boulder. Lab. for Atmospheric and Space Physics.

ANALYSIS OF IUE SPECTRA USING THE INTERACTIVE DATA LANGUAGE

Charles L. Joseph *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 801-803 refs (For primary document see N81-25893 16-90)

Avail: NTIS HC A99/MF A01 CSCL 03B

The Interactive Data Language (IDL) is used to analyze high resolution spectra from the IUE. Like other interactive languages, IDL is designed for use by the scientist rather than the professional programmer, allowing him to conceive of his data as simple entities and to operate on this data with minimal difficulty. A package of programs created to analyze interstellar absorption lines is presented as an example of the graphical power of IDL. T.M.

N81-25984*# Colorado Univ. at Boulder. Lab. of Atmospheric and Space Physics.

PROBLEMS AND PROGRAMMING FOR ANALYSIS OF IUE HIGH RESOLUTION DATA FOR VARIABILITY

C. A. Grady *In* NASA. Goddard Space Flight Center The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 805-810 refs (For primary document see N81-25893 16-90)

Avail: NTIS HC A99/MF A01 CSCL 03B

Observations of variability in stellar winds provide an important probe of their dynamics. It is crucial however to know that any variability seen in a data set can be clearly attributed to the star and not to instrumental or data processing effects. In the course of analysis of IUE high resolution data of alpha Cam and other O, B and Wolf-Rayet stars several effects were found which cause spurious variability or spurious spectral features in our data. Programming was developed to partially compensate for these effects using the Interactive Data language (IDL) on the LASP PDP 11/34. Use of an interactive language such as IDL is particularly suited to analysis of variability data as it permits use of efficient programs coupled with the judgement of the scientist at each stage of processing. T.M.

N81-25985*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

EFFECTS OF TEMPERATURE FLUCTUATIONS OF IUE DATA QUALITY

Randall W. Thompson (Computer Sciences Corp.), Barry E. Turnrose (Computer Sciences Corp.), and Ralph C. Bohlin *In its* The Universe at Ultraviolet Wavelengths: The First Two Yrs. of Intern. Ultraviolet Explorer 1981 p 811-819 refs (For primary document see N81-25893 16-90)

(Contract NAS5-24350)

Avail: NTIS HC A99/MF A01 CSCL 03B

Analysis of IUE calibration lamp images shows that variation in the temperature of the scientific instrument causes shifts in the location of the spectral format with respect to the reseau grid on the detector and in the location of the reseaux themselves. In high dispersion, a camera head amplifier temperature difference of 6C corresponds to a shift of 4 pixels in the spectral format for LWR and 2 pixels for SWP along the dispersion direction. Shifts perpendicular to the disperson (for the same temperature difference) are less than one pixel for both cameras. In low dispersion spectra, the shifts are similar but orthogonal to those described above with the larger motion lying in the direction perpendicular to the dispersion. In both dispersion modes, the observed shifts are apparently independent of wavelength. In high dispersion, the constant pixel shift mimics a constant velocity error. T.M.

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N81-25986# Academy of Sciences (USSR), Moscow. Space Research Inst.

PHOTOCHEMISTRY OF THE VENUS ATMOSPHERE DOWN TO 50 km (RESULTS OF CALCULATIONS)

V. A. Krasnopolsky and V. A. Parshev 1980 55 p refs

(Rept-591) Copyright. Avail: Issuing Activity

Based on data obtained from Venera 11 and 12, and Pioneer Venus spacecraft, the chemical composition of the atmosphere of the planet Venus is modelled. Photolysis, boundary conditions, altitude profiles, transport theory, and vertical distribution are discussed. S.F.

N81-25987# Academy of Sciences (USSR), Moscow. Space Research Inst.

LABORATORY MODEL OF THE INDUCED MAGNETOSPHERE AND ITS COMPARISON WITH THE SPACECRAFT MEASUREMENTS NEAR VENUS

E. M. Dubinin, P. L. Israelvich, I. M. Podgorny, and S. I. Shkolnikova 1980 33 p refs

(Rept-587) Copyright. Avail: Issuing Activity

A three-dimensional model of the induced magnetosphere is planetary bodies was made on the basis of the simulative experiment results. The existence of this magnetosphere is

associated with unipolar induction currents. The appearance of of electrodynamic forces associated with the formation of the induced magnetosphere leads to the acceleration of ionospheric plasma downwards and to the formation of the plasma tail together with the magnetic tail. The night ionosphere can be explained by plasma flowing to the night side under the effect of these forces. In the case of Venus is shown that for the variation of the solar wind dynamic pressure the magnetic field tubes can penetrate in from the solar wind because of the instability of the Venus ionosphere boundary moving with the acceleration. The penetration of ionosphere ions through the tube lateral walls produces the axial current of electrons from the solar wind leading to twisting of field tubes into the rope. M.G.

N81-25988# Academy of Sciences (USSR), Moscow. Space Research Inst.

INITIAL DATA FOR CALCULATION OF VENUS' ATMOSPHERIC PHOTOCHEMISTRY AT HEIGHTS DOWN TO 50 km

V. A. Krasnopolsky and V. A. Parshev 1980 49 p refs
(Rept-590) Copyright. Avail: Issuing Activity

On the basis of the present experimental data obtained by Venera-11,12 and Pioneer-Venus, the initial data for creation of a consistent model of the Venus atmosphere neutral composition were analyzed. The main photochemical processes determining the concentrations of the CO2, H2O, HCl and SO2 photolysis products were considered. The processes of sulphuric acid and elemental sulphur photochemical formation were analyzed; the SO2 photolysis is considered as the main source of active sulphur and oxygen for the formation of surphuric acid. The list of the components and reactions occurring in the atmosphere was enlarged (26 components and 102 reactions). S.F.

N81-25989# Academy of Sciences (USSR), Moscow. Space Research Inst.

OPTIMAL STRATEGY OF COMET HALLEY EPHERMIS IMPROVEMENT

B. J. Bakshian, R. R. Nazirov, A. A. Sukhanov, and P. E. Eliasberg 1980 9 p refs Presented at the 31st Intern. Astron. Federation (IAF) Congr. Session 1: Astrodyn., Tokyo, 21-28 Sep. 1980
(Rept-80-E-209; Rept-301) Copyright. Avail: Issuing Activity

Errors in determining the orbit of the Halley comet during its apparition in 1986 are studied. It is assumed that only maximum errors of the initial data are known. Under this condition the maximum errors in determining the cometary orbit are computed, and these errors are minimized by means of optimization of the estimation algorithm. Author

N81-25990# Academy of Sciences (USSR), Moscow. Space Research Inst.

THE INFLUENCE OF THE INTERPLANETARY MAGNETIC FIELD ON THE BOW SHOCK NEAR VENUS

S. A. Romanov 1980 17 p refs
(Rept-297) Copyright. Avail: Issuing Activity

Measurements made by Pioneer Venus and by Venera 9 and 10 spacecraft were used to study the dependence of the position of a point at which the bowshock front is passed from the direction of the interplanetary field component perpendicular to a vector of the solar wind velocity. The planetocentric distance to the bow shock corresponding to each crossing was plotted to the theta (eta beta) value. In each case, the IMF value was determined by averaging over 5 min interval closest to the front crossing moments. The found dependence shows that the distance from the planet center to the bow shock of Venus near the terminator plane grows for the increase and reduces for the decrease of the IMF value. When the IMF value varies from 5 gamma to 15 gamma the distance is the terminator plane. A.R.H.

N81-25991# Academy of Sciences (USSR), Moscow. Space Research Inst.

ABOUT THE MAGNETIC BARRIER NEAR VENUS

V. G. Pivovarov, N. V. Erkaev, A. S. Volokitin, T. K. Breus, and S. V. Ivanova 1981 19 p refs
(Rept-631) Copyright. Avail: Issuing Activity

The magnetic barrier near Venus was analyzed based on mathematical models of plasma flow-around the bodies. The calculated characteristics of the magnetic barrier are compared with the experimental data. Author

N81-25992*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

VIKING SITE SELECTION AND CERTIFICATION

Harold Masursky (Geological Survey, Flagstaff, Ariz.) and Norman L. Crabill Washington 1981 39 p refs
(NASA-SP-429) Avail: NTIS HC A03/MF A01 CSCL 03B

The landing site selection and certification effort for the Viking mission to Mars is reviewed from the premission phase through the acquisition of data and decisions during mission operations and the immediate postlanding evaluation. The utility and limitations of the orbital television and infrared data and ground based radar observation of candidate and actual landing sites are evaluated. Additional instruments and types of observations which would have been useful include higher resolution cameras, radar altimeters, and terrain hazard avoidance capability in the landing system. Suggestions based on this experience that might be applied to future missions are included. J.D.H.

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N81-25993# Academy of Sciences (USSR), Moscow. Space Research Inst.

OBSERVATIONS OF THE SOLAR WIND STREAM WITH HIGH ABUNDANCE OF HEAVY IONS AND CORONAL CONDITIONS

G. N. Zastenker and Yu. I. Yermolaev 1980 19 p refs
(Rept-579) Copyright. Avail: Issuing Activity

A number of long intervals, during which heavy ions were detected in high energy 'tail' of the energy spectra of solar wind ions, were recorded by a plasma spectrometer onboard the Prognoz 7 satellite. Such a region with unusual features as low velocity, high density, low temperature of protons and, especially, low temperature of alpha particles was observed on December 10-13, 1978. The time dependence of these parameters makes it possible to recognize this event as 'noncompressive density enhancement'. In this region some heavy ions as O(+6), O(+7), Si(+7), Si(+8), Si(+9) and a group of iron from Fe(+6) to Fe(+13) were identified with the electrostatic analyzer. The abundance of these irons relative to protons was about ten times higher then that previously observed. The coronal temperature estimated from the ratios of the iron fluxes with the various ionization states is higher than one determined earlier for the oxygen ions. Author

N81-25994*# Colorado Univ., Denver. Dept. of Astro-Geophysics.

SOLAR RADIO EMISSION

Martin V. Goldman and Dean F. Smith May 1981 123 p refs
(Grants NAGw-91; NSF ATM-79-16837; NSF ATM-80-20426; AF-AFOSR-0022-80)
(NASA-CR-164469; CU-1042) Avail: NTIS HC A06/MF A01 CSCL 03B

Active areas of both observational and theoretical research in which rapid progress is being made are discussed. These include: (1) the dynamic spectrum or frequency versus time plot; (2) physical mechanisms in the development of various types of bursts; (3) microwave type 1, 2, 3, and moving type 4 bursts; (4) bursts caused by trapped electrons; (5) physics of type 3 bursts; (6) the physics of type 2 bursts and their related shocks; (7) the physics of both stationary and moving traps and associated type 1 and moving type 4 bursts; and (8) the status of the field of solar radio emission. A.R.H.

N81-25995*# California Univ., Berkeley. Space Sciences Lab.

UNIVERSITY OF CALIFORNIA ELECTRON AND X-RAY EXPERIMENTS ON ISEE-3 Final Report, 11 Apr. 1975 - 31 Oct. 1980

Kinsey A. Anderson Jan. 1981 78 p

(Contract NAS5-22307)
(NASA-CR-166666; SSL-Ser-22-Issue-3) Avail: NTIS HC A05/MF A01 CSCL 03B

The history of the University of California solar and interplanetary electron experiment and the solar X-ray experiment is outlined, and the two instruments used are described. The roles of personnel are mentioned and the data analysis projects completed or begun are summarized. A bibliography is included. A.R.H.

N81-25996*# Texas Univ. at San Antonio. Center for Applied Research and Technology.
RESEARCH ON SOLAR-WIND AND MAGNETOSPHERIC ELECTRIC FIELDS AND PLASMAS Final Report, 1 Oct. 1979 - 1 May 1981
James L. Burch 1 May 1981 22 p refs
(Grant NsG-5418)
(NASA-CR-164372) Avail: NTIS HC A02/MF A01 CSCL 03B

The phenomena of particle preciptation and ion convection at high latitudes and their response to variations in the interplanetary magnetic field. Data from the low energy electron experiment and the retarding potential analyzer drift meter on Atmosphere Explorers C and D were analyzed. Additional data from the spacecraft Imp-J were utilized. For individual title, see N81-25997.

N81-25997*# Southwest Research Inst., Houston, Tex. Dept. of Space Science.
A SATELLITE INVESTIGATION OF ENERGY FLUX AND INFERRED POTENTIAL DROP IN AURORAL ELECTRON ENERGY SPECTRA
J. D. Meniett and J. L. Burch (Texas Univ. at San Antonio) *In* Texas Univ. at San Antonio Res. on Solar-Wind Magnetospheric Elec. Fields and Plasmas 1 May 1981 16 p refs (For primary document see N81-25996 16-92)
Avail: NTIS HC A02/MF A01 CSCL 03B

Because predicted relationship (epsilon directly varies with V squared) between auroral electron energy flux (epsilon) and the inferred acceleration potential drop (V) for accelerated Maxwellian distributions was favorably tested by other using sounding rocket data for the limiting case of eVE> 1 (where Ec is the characteristic energy of the accelerated Maxwellian distribution) and for a single inverted-V, observed by the Injun 5 satellite, data from Atmosphere D were used to extend these studies over the range .2 eV/Ec < 5 and for a wide range of latitudes and local times on both the nightside and the dayside. Results show good agreement with the full accelerated Maxwellian model. An analytical approximation to the electron energy flux was derived which better describes the data over the range .2 eV/Ec < approximated 3. Analyses of individual energy spectra at small and large pitch angles through well-defined inverted-V structures suggest that the altitude of the inferred potential drop maximizes near the center of the inverted-V's. A.R.H.

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N81-25998# Naval Research Lab., Washington, D. C.
A PARAMETRIC STUDY OF INTERSTELLAR HELIUM ATOMS INCIDENT UPON THE EARTH
R. R. Meier 28 Jan. 1981 37 p refs
(AD-A094383; NRL-MR-4423) Avail: NTIS HC A03/MF A01 CSCL 03/2

Calculations of the intensity of interstellar helium atoms at earth orbit are made with a model which takes into account perturbation of the Maxwell-Boltzmann velocity distribution by solar gravity and photoionization loss. Seasonal sky maps are presented and assessments of the sensitivity of the intensity of atoms in the vicinity of the earth to the various parameters of the gas are given. GRA

99 GENERAL

N81-25999 State Univ. of New York, Stony Brook.
ATMOSPHERIC STRUCTURES OF THE GIANT PLANETS FROM RADIATIVE-CONVECTIVE EQUILIBRIUM MODELS Ph.D. Thesis
John Frederick Appleby 1980 343 p
Avail: Univ. Microfilms Order No. 8109033

A number of radiative convective equilibrium states were produced for the Giant Planets with particular emphasis on Uranus and Neptune, in a broad based examination of atmospheric thermal structure. The analysis includes nonuniform stratospheric aerosol heating, a convective penetration model for Neptune, and a treatment of CH4 non-LTE effects. The results for Jupiter show that the temperature profiles based on analysis of the Voyager radio occulation data, can be plausibly interpreted as arising at least in part, from solar heating by nonuniform distributed 'aerosols'. A similar conclusion holds for Saturn models, as derived from Pioneer radio occultation measurements. A wider range of models is considered for Uranus and Neptune, reflecting the comparatively sparse observational constraints on strapospheric temperatures in Uranus, and the relatively large heating required in the stratosphere of Neptune. Dissert. Abstr.

N81-26000# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
LA RECHERCHE AEROSPATIALE, BI-MONTHLY BULLETIN NUMBER 1980-4
Claude Sevestre, ed. ESA Mar. 1981 85 p refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-4, Jul. - Aug. 1980 p 221-299
(ESA-TT-672) Avail: NTIS HC A05/MF A01

Noise generated by vortex tubes, numerical simulation of three dimensional wall separation, ONERA ramjet test facilities, and infrared imaging systems are discussed. A mathematical model of narrow band Gaussian noise zero crossings is described. Analysis of nonstationary signals emitted by a moving jet engine, and development of a CO2 pulsed laser are also covered. For individual titles, see N81-26001 through N81-26007.

N81-26001# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
NOISE GENERATED BY VORTEX TUBES DURING THEIR DEVELOPMENT **c71**
Robert Legendre *In its* La Rech. Aerospatiale, Bi-Monthly Bull. No. 1980-4 (ESA-TT-672) Mar. 1981 p 3-10 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-4, Jul. - Aug. 1980 p 221-228 Original report in FRENCH previously announced as A80-52913/4 (For primary document see N81-26000 16-99)
Avail: NTIS HC A05/MF A01

The development of vortex tubes and the noise emitted by such tubes is analyzed using the Lighthill acoustics equation in a calm medium. It is shown that the vorticity induced by the difference of velocities on the two sides of the mixing zone tends to concentrate in vortex tubes; a vortex tube, tending to warp and stretch due to velocities induced by neighboring tubes, is damped down through viscosity. Vortex tube development is accompanied by pressure and density variations inside the tube which are sources of noise. The acoustic potential of such sources is estimated. Author (ESA)

N81-26002# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
NUMERICAL SIMULATION OF A THREE DIMENSIONAL WALL SEPARATION **c34**
Germain Billet *In its* La Rech. Aerospatiale, Bi-Monthly Bull. No. 1980-4 (ESA-TT-672) Mar. 1981 p 11-23 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-4, Jul. - Aug. 1980 p 229-240 Original report in FRENCH previously announced as A80-52914/4 (For primary document see N81-26000 16-99)
Avail: NTIS HC A05/MF A01

A three dimensional unsteady separated flow over a step having a chevron planform in a channel, bounded by vertical

walls was studied. A numerical approach was used in which the walls are replaced by a surface distribution of quadrilateral vortex rings, and the vortex sheet by a discrete vortex volumic distribution. It is shown that the vorticity emission mechanism and the interactions between the vortex sheets and the wall, allow a correct description of the time evolution of the vortex sheets and show numerical results in good agreement with experiment. Author (ESA)

N81-26003# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

ONERA RAMJET TEST FACILITIES **c14**

Pierre Berton and Dominique Regard *In its* La Rech. Aerospatiale, Bi-Monthly Bull. No. 1980-4 (ESA-TT-672) Mar. 1981 p 25-44 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-4, Jul. - Aug. 1980 p 241-258 Original report in FRENCH previously announced as A80-52915/4 (For primary document see N81-26000 16-99)

Avail: NTIS HC A05/MF A01

Wind tunnel requirements and facilities for testing integrated rocket ramjet missiles and motors are discussed. Pressure, temperature and flow obtained rate measurements for solid or liquid fuel ramjets are obtained with water cooled probes, ultrasonic flowmeters, and an analogy method envolving the weighing of a gas generator on a continuous weighing device. Test benches are described for solid fuel tests and for rocket and integrated rocket connected pipe or semifree jet tests. Wind tunnel facilities are indicated and capabilities are described for the S4 supersonic tunnel which permits testing of full scale ramjet missiles with solid propellant boosters. Author (ESA)

N81-26004# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

INFRARED IMAGING SYSTEMS: OPERATING PRINCIPLES, TESTS, UTILIZATION **c74**

Georges Gauffre and Jean-Claude Fontanella *In its* La Rech. Aerospatiale, Bi-Monthly Bull. No. 1980-4 (ESA-TT-672) Mar. 1981 p 45-55 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-4, Jul. - Aug. 1980 p 259-269 Original report in FRENCH previously announced as A80-52916/4 (For primary document see N81-26000 16-99)

Avail: NTIS HC A05/MF A01

Various infrared imaging systems are described and the measurement characteristics of these systems are presented emphasizing spatial and thermal resolution. The fundamental limit of thermal resolution due to photon noise is discussed. Various applications of these systems involving physical measurement are described. Author (ESA)

N81-26005# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

ZERO CROSSINGS PROPERTIES OF A NARROW BAND PROCESS TO DETERMINE THE RELIABILITY OF A TWO FREQUENCY ENCODING: APPLICATION TO EVALUATING ITS AUTOCORRELATION ENVELOPE **c32**

Jacques Hay *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1980-4 (ESA-TT-672) Mar. 1981 p 57-68 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-4, Jul. - Aug. 1980 p 271-281 Original report in FRENCH previously announced as A80-52917/4 (For primary document see N81-26000 16-99)

Avail: NTIS HC A05/MF A01

A mathematical model of narrow band Gaussian noise zero crossing was developed to facilitate the calibration of electronic equipment for detecting two frequency codes on single track tape. The model makes use of the small probability that a narrow band process will have a long series of zero crossings. The model is also considered with respect to evaluating the autocorrelation envelope. Author (ESA)

N81-26006# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

CONTRIBUTION TO THE STUDY OF NONSTATIONARY SIGNALS EMITTED BY MOVING JET ENGINES: APPLICATION TO SPECIAL ANALYSIS AND IMAGING. PART 1 **c07**

Jacques Hay and Max Ernoult *In its* La Rech. Aerospatiale, Bi-Monthly Bull. No. 1980-4 (ESA-TT-672) Mar. 1981 p 69-82 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-4, Jul. - Aug. 1980 p 283-296 Original report in FRENCH previously announced as A80-52918/4 (For primary document see N81-26000 16-99)

Avail: NTIS HC A05/MF A01

A special class of nonstationary random processes were developed in order to deduce the directivity per frequency band by associating with each spectrum, the emission angle. A time frequency spectrum is defined which is shown to be capable of giving back the correct results of the stationary case (far field). It is further shown that knowing the motion of the source, helps in improving the spectral resolution and particularly, the spectral resolution of a synthetic antenna. R.C.T.

N81-26007# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

A CO2 LASER DELIVERING INTENSE PULSES AT HIGH REPETITION RATES **c36**

Jean Bonnet, Gerard Fournier, and Daniel Pigache *In its* La Rech. Aerospatiale, Bi-Monthly Bull., No. 1980-4 (ESA-TT-672) Mar. 1981 p 83-85 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-4, Jul. - Aug. 1980 p 297-299 Original report in FRENCH previously announced as A80-52919/4 (For primary document see N81-26000 16-99)

Avail: NTIS HC A05/MF A01

A CO2 laser with an electron beam controlled discharge was developed. The laser is characterized by an average of 2 kW for 20 J, 10 microsec pulses, repeated at 100 Hz. The experimental setup is described, with emphasis on the electron gun and the discharge chamber/cavity system. Author (ESA)

N81-26008# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

LA RECHERCHE AEROSPATIALE, BIMONTHLY BULLETIN NUMBER 1980-5

Claude Sevestre, ed. ESA Mar. 1981 78 p refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), No. 1980-5, Sep. - Oct. 1980 P 301-371

(ESA-TT-673; Rept-198) Avail: NTIS HC A05/MF A01

Numerical computation of three dimensional transonic internal flows, pressure distribution computation for a helicopter blade, and transition and separation flow visualization in a water tunnel are discussed. A method for identifying the vibration modes of a structure, a study of nonstationary signals emitted by a moving jet engine, and a discussion of combustion noise are also included. For individual titles, see N81-26009 through N81-26014.

N81-26009# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

NUMERICAL COMPUTATION OF THREE DIMENSIONAL TRANSONIC INTERNAL FLOWS **c02**

Jacques Brochet *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-5 (ESA-TT-673) Mar. 1981 p 3-18 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-5, Sep. - Oct. 1980 p 301-315 (For primary document see N81-26008 16-99)

Avail: NTIS HC A05/MF A01

A pseudo unsteady method for solving the Euler equations is applied to the numerical computation of three dimensional transonic internal flows. Mathematical properties of the pseudo unsteady system are recalled. The extension to three dimensions of a general technique for treating boundary conditions is described. Numerical results are presented for flows with shocks in a rectangular section of a nozzle and in a linear cascade of a supersonic compressor positioned in a channel with converging walls. Author (ESA)

N81-26010# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

PRESSURE DISTRIBUTION COMPUTATION ON A NON-LIFTING SYMMETRICAL HELICOPTER BLADE IN FORWARD FLIGHT **c05**

Jean-Jacques Chattot and Jean-Jacques Philippe *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-5 (ESA-TT-673) Mar. 1981 p 19-33 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-5, Sep. - Oct.

1980 p 317-330 (For primary document see N81-26008 16-99)
Avail: NTIS HC A05/MF A01

Three dimensional unsteady transonic flows past helicopter rotor blades are analyzed. A computer program solving the three dimensional unsteady transonic small disturbance equation is described in detail. It can be applied to a blade of almost arbitrary geometry in the case of a nonlifting rotor. The numerical results are compared with experimental data as well as with computations. An example of application of the code is presented which concerns a blade tip. Results show weaker transonic phenomena on the advancing blade. Author (ESA)

N81-26011# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

TRANSITION AND SEPARATION: VISUALIZATIONS IN THE ONERA WATER TUNNEL **c34**

Henri Werle *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-5 (ESA-TT-673) Mar. 1981 p 35-49 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-5, Sep. - Oct. 1980 p 331-345 (For primary document see N81-26008 16-99)
Avail: NTIS HC A05/MF A01

Photography with dye and bubble flow visualization is used to demonstrate the onset of transition flow. Two dimensional, axisymmetric and three dimensional transition flows as well as the effects of the transition on the turbulent boundary layer flow, including separation, are discussed phenomenologically. Natural transition, transition caused by bubble separation, with or without reattachment, transition triggered by an obstacle, and transition resulting from lateral shear are shown for the various models tested: flat plate, airfoil, fuselage, sphere, cylinder, straight wing and sweptback wing. Author (ESA)

N81-26012# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

A METHOD FOR MODAL IDENTIFICATION **c39**

Gabriel Coupry *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-5 (ESA-TT-673) Mar. 1981 p 51-56 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-5, Sep. - Oct. 1980 p 347-352 (For primary document see N81-26008 16-99)
Avail: NTIS HC A05/MF A01

An iterative process which determines the modal signature of a structure is described. An excitation configuration is generated that blocks all the modes, except one, which is then isolated. The generalized mass and damping are measured by smoothing the response to this excitation by a least squares technique based on a one degree of freedom model. The method was evaluated during ground vibration tests of two different aircraft. The generalized parameters were used to calculate response to a one point excitation and comparisons were made with test results. The process does not converge toward a perfect approximation unless the damping matrix is nondiagonal, but good agreement with measurements can still be shown.
Author (ESA)

N81-26013# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

CONTRIBUTION TO THE STUDY OF NONSTATIONARY SIGNALS EMITTED BY MOVING JET ENGINES: APPLICATION TO SPECTRAL ANALYSIS AND IMAGING. PART 2 **c07**

Jacques Hay and Max Ernoult *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-5 (ESA-TT-673) Mar. 1981 p 57-73 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-5, Sep. - Oct. 1980 p 353-368 (For primary document see N81-26008 16-99)
Avail: NTIS HC A05/MF A01

In order to install microphones closer to the trajectory of a swiftly moving noise source and to deduce directivities comparable to those measured in the far field, but less sensitive to propagation conditions, a special class of nonstationary random processes was studied. Conventional short time spectral analysis is reviewed; periodogram smoothing and autoregressive modal evaluation are covered. A time frequency spectrum is defined which is capable of giving correct results for the stationary case (far field). Moreover, knowing the motion of the source helps in improving spectral resolution, and particularly spatial resolution for a synthetic antenna. Dedopplerization signal processing provides a resolution similar to that obtained in static tests. Results of experiments on a point source and a jet are given. Author (ESA)

N81-26014# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

COMBUSTION NOISE **c25**

Robert Legendre *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-5 (ESA-TT-673) Mar. 1981 p 75-78 Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-5, Sep. - Oct. 1980 p 369-371 (For primary document see N81-26008 16-99)
Avail: NTIS HC A05/MF A01

Combustion phenomena are used as a basis for extending the validity of the noise propagation equation regarding a turbulent gas flow undergoing combustion. An overview of turbulent combustion is given which includes flame propagation. The noise propagation equation is presented and the argument put forward that the effect of combustion is exerted through the density variation it causes. An evaluation of combustion noise which includes the density variation in the mean permanent flow is then exposed. It is concluded that the sound equation remains valid within gases under turbulent combustion and the sound source intensity, which appears in the right hand member, remains equal to the relative density variation rate but this varies much faster under the effect of combustion than under the effect of the forces of inertia. Neverthless, for noise, only the fluctuating part of the right hand member is significant, and the complexity of the phenomena permits only a rough evaluation of combustion noise. Author (ESA)

N81-26015# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

LA RECHERCHE AEROSPATIALE, BIMONTHLY BULLETIN NUMBER 1980-6

Claude Sevestre, ed. ESA Dec. 1980 95 p refs Transl. into ENGLISH of La Recherche Aerospatiale, Bull. Bimestriel (Paris), no. 1980-6, Nov. - Dec. 1980 p 373-462
(ESA-TT-687) Avail: NTIS HC A05/MF A01

The solution of Navier-Stokes equations, vibration of wind tunnel models, and eutectic composite turbine blades are treated, separately. Aeroacoustics of industrial burners, structural computation methods in viscoplasticity, computational algorithms and an inverse method for cascade design are also featured. For individual titles, see N81-26016 through N81-26022.

N81-26016# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

SOLUTION OF THE NAVIER-STOKES EQUATIONS BY A METHOD OF HIGH ACCURACY IN SPACE AND TIME **c34**

Ph. Roy *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-6 (ESA-TT-687) Dec. 1980 p 3-15 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull Bimestriel (Paris), no. 1980-6, Nov. - Dec. 1980 p 373-385 Original report in FRENCH previously announced as A81-19551 (For primary document see N81-26015 16-99)
Avail: NTIS HC A05/MF A01

It is noted that the finite difference scheme used to estimate time derivatives for the solution of partial differential equations is the most significant source of error between the exact solution and the computed one. A method of high order time differencing is developed; the influence of the order on the accuracy and cost of computation is examined. The method is first tested with the Burgers equation; attention is then given to the computation of two dimensional and three-dimensional flows of incompressible fluids (the Navier-Stokes equation). Author (ESA)

N81-26017# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

MODEL VIBRATIONS BELOW LOW SPEED STALL **c08**

X. Vaucheret *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-6 (ESA-TT-687) Dec. 1980 p.17-28 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-6, Nov. - Dec. 1980 p 387-397 Original report in FRENCH previously announced as A81-19552 (For primary document see N81-26015 16-99)
Avail: NTIS HC A05/MF A01

Vibrations of a string mounted model beyond stall are analyzed, using the nonlinear equation of motion established for moderate amplitudes around high angle of attack according to a time/angle of attack cycle. The nonlinear solution yields frequency and damping variations versus amplitude and amplitude history beyond stall. A parametric study shows that the effects of maximum angle of attack and the duration of the step at this angle are decisive. For hard stall, the operator can perform the tests from indications that are aimed at avoiding amplitude divergences at nonzero frequency. Author (ESA)

N81-26018# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

METALLURGICAL PROBLEMS ENCOUNTERED IN THE CONCEPTION AND DEVELOPMENT OF DIRECTIONALLY SOLIDIFIED COMPOSITES FOR TURBINE BLADE APPLICATIONS c07

T. Khan and J. F. Stohr *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-6 (ESA-TT-687) Dec. 1980 p 29-58 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-6, Nov. - Dec. 1980 p 399-425 Original report in FRENCH previously announced as A81-19553 (For primary document see N81-26015 16-99)

Avail: NTIS HC A05/MF A01

The development of COTAC-type DS eutectic composites is reviewed with attention given to the basic approach, the difficulties encountered, and the solutions adopted. The development of such composites (metal matrices reinforced with carbide fibers)required a multidisciplinary approach, ranging from the DS technique to the microscopic and macroscopic aspect of mechanical behavior in light of phase diagrams and solid state reactions. The type of material used, COTAC 74 and especially COTAC 744, makes it possible to achieve a temperature gain of 60 to 100 C, depending on specific applications, as compared to current conventional superalloys. A molten tin bath is used to maintain the planarity of the melting isotherm while fabricating near net shaped parts (turbine blades). Author (ESA)

N81-26019# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

AEROACOUSTICAL DIAGNOSTICS IN INDUSTRIAL COMBUSTION c71

G. Elias, J. Maulard, A. Ivernel, and J. P. Millour *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-6 (ESA-TT-687) Dec. 1980 p 59-67 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-6, Nov. - Dec. 1980 p 426-436 (For primary document see N81-26015 16-99)

Avail: NTIS HC A05/MF A01

Oxygen-rich flames were studied, using laser anemometry, infrared radiometry, and temperature and acoustic measurements. A link between the aerodynamic field of the flames and their acoustic emission is established. The results obtained on three burners of different configuration are compared. Emphasis is placed on the resemblances between the flames (strong turbulence, presence of large long-lived vortices dominating the turbulent structure, and noise generators) and on the differences, related mainly to the deviations between the characteristic velocities of the flows and their mixing properties with the external air. Turbulence spectra measured on the radiometer and velocity signals show comparable shapes and highly correlated out of phase signals. Large scale structures in the flow are shown to contribute significantly to the acoustic field. Author (ESA)

N81-26020# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

STRUCTURAL CALCULATIONS IN VISCOPLASTICITY. COMPARISON BETWEEN FINITE ELEMENT METHODS AND BOUNDARY INTEGRAL EQUATION METHODS c39

M. Chaudonnert *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-6 (ESA-TT-687) Dec. 1980 p 69-75 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-6, Nov. - Dec. 1980 p 437-443 Original report in FRENCH previously announced as A81-19554 (For primary document see N81-26015 16-99)

Avail: NTIS HC A05/MF A01

The main characteristics of the boundary integral equation (BIE) method and the finite element method (FEM) are reviewed, and an extension of these two methods to the case of nonlinear cyclic viscoplastic behavior is described. Required computation times are compared for the BIE method and the FEM when applied to the same structure. Several examples show that the BIE method is generally less time consuming than the FEM, even though a meshing of the interior is required. Author (ESA)

N81-26021# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

PROGRAMMING BY POLYALGORITHMS. DESCRIPTION AND EXAMPLES OF IMPLEMENTATION c61

C. Jamy, M. Vanbreugel, and A. Potel *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-6 (ESA-TT-687) Dec. 1980 p 77-90 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-6, Nov. - Dec. 1980 p 445-458 Original report in FRENCH previously announced as A81-19555 (For primary document see N81-26015 16-99)

Avail: NTIS HC A05/MF A01

A family of subprograms is introduced, called polyalgorithms, which are constructed by combining a certain number (as large as possible) of subprograms for solving an elementary problem of numerical analysis (e.g., linear systems, nonlinear systems, differential equations, quadratures, minimum functions of R to the n in R, etc.). Two application examples are presented, i.e., a numerical integration polyalgorithm and a polyalgorithm for minimizing functions of R to the n in R, as well as utilization examples from two sets of test functions. It is shown that these polyalgorithms can aid users in choosing fundamental equations, and that the effective accuracy of the solution provided can be evaluated by comparing the results obtained through the various algorithms in the polyalgorithm. Author (ESA)

N81-26022# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

CASCADE DESIGN THROUGH AN INVERSE METHOD c07

G. Meauze and A. Lesain *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1980-6 (ESA-TT-687) Dec. 1980 p 91-94 ref Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1980-6, Nov. - Dec. 1980 p 459-462 Original report in FRENCH previously announced as A81-25875 (For primary document see N81-26015 16-99)

Avail: NTIS HC A05/MF A01

Solutions are shown for the design of a compressor or turbine cascade. A pseudo-unsteady semi-inverse calculation method is used. Transonic and supersonic cascades are treated. There are two versions of the calculation. The first allows the determination of a blade profile with an imposed pressure distribution as a function of a linear or curvilinear abscissa, partially or totally on the suction side and on the pressure side of the profile; the solidity as well as the pressure and downstream angle are a result of the calculation. The second allows the determination of a blade profile following a given thickness law and a pressure distribution imposed only on the suction side, the solidity being given whereas the downstream angle and pressure result from the calculation. Author (ESA)

N81-26023# Western Research Corp., San Diego, Calif.

TRANSVERSE RF ACCELERATOR Status Report, 15 Aug. - 15 Nov. 1980

Nino R. Pereira 15 Feb. 1981 5 p refs

(Contract N00014-80-C-0902; DARPA Order 3747)

(AD-A097942; WRC-R-307) Avail: NTIS HC A02/MF A01

CSCL 20/7

The feasibility studies on the transverse RF accelerator are progressing in all areas covered by the contract. The initial estimates have generally been corroborated by our calculations. The electromagnetic fields in the RF acceleratory cavity, a prolate ellipsoid of revolution, were analysed in terms of known special functions. A computer program for these functions was acquired and implemented. We are presently using the program to verify the asymptotic fields used in energy transfer calculations. An analytical calculation of beam loading gave mixed results. The difficulty is that the beam is resonant with the fields, and therefore strongly perturbed; hence the loading problem is fully nonlinear and very difficult to solve analytically. The calculations on front end injection of electron bunches show that large currents in the kilo ampere range can be injected. A laser activated cathode would emit electron bunches which can be laterally compressed

without excessive de-bunching. Only minor emittance calculations have been performed to date. Since the electromagnetic fields are now know exactly there should be no trouble with this.GRA

N81-26024# Air Force Geophysics Lab., Hanscom AFB, Mass.
AFGL FISCAL YEAR 1982 AIR FORCE TECHNICAL OBJECTIVES DOCUMENT
Oct. 1980 31 p refs Supersedes AFGL-TR-79-0146
(AD-A098732; AFGL-TR-80-0210; AFGL-TR-79-0146) Avail: NTIS HC A03/MF A01 CSCL 04/1

This report comprises the Air Force Geophysics Laboratory Fiscal Year 1981 Technical Objectives Document, and describes the five Technology Planning Objectives in environmental technology. The environmental areas of concern include optical and space physics, meteorology, aeronomy and terrestrial sciences. In addition, a brief summary of the basic research program is included. GRA

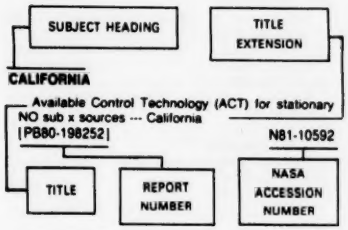
N81-26025# California Univ., Livermore. Lawrence Livermore Lab.
ENERGY AND TECHNOLOGY REVIEW, MARCH 1981
Mar. 1981 32 p refs
(Contract W-7405-eng-48)
(UCRL-52000-81-3) Avail: NTIS HC A03/MF A01

Topics include fiber optics, gun barrel erosion, and uranium laser isotope separation. DOE

N81-26026# California Univ., Livermore. Lawrence Livermore Lab.
ENERGY AND TECHNOLOGY REVIEW, APRIL 1981
Apr. 1981 34 p refs
(Contract W-7405-eng-48)
(UCRL-52000-81-4) Avail: NTIS HC A03/MF A01

Shock waves modeling the giant planets, modeling of solid state materials for solar cells, and flame quenching in internal combustion engines are discussed. DOE

Typical Subject Index Listing



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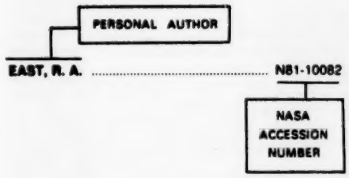

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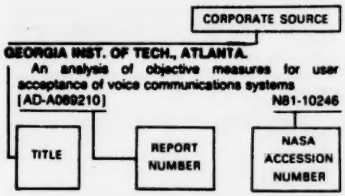

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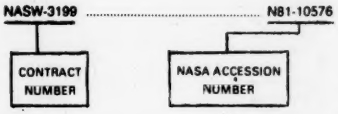

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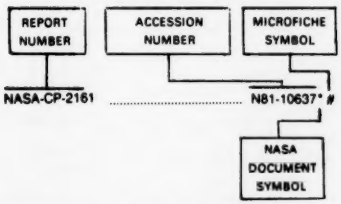

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